THE OLD TIMER'S BULLETIN

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Published for the Collector, Historian and Old Time Wireless Operator

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MIRROR-SCREW TELEVISION RECEIVER

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The "Old Timer's Bulletin": The AWA Journal

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Please write legibly. Enclosing an SASE speeds replies.

Dues and address changes: Joyce Peckham (Secretary), Box E, Breesport, NY 14816, (607) 739-5443. Dues: 1 year, $12; 2 years, $22; 3 years, $33; overseas (airmail), $15. Make check payable to AWA.

Bulletin material; news of non-joint meets; orders for the AWA Review or OTB back issues: Ludwell Sibley (Editor), 44 E. Main St., Flemington, NJ 08822-1224, (908) 782-4894. **(Exception: column material should go to column editors.)**

Want ads, coordination of joint meets and slide/video shows: Richard Ransley (First Vice President), Box 41, Sodus, NY 14551.

Museum operation: Bruce Kelley (Curator), 59 Main St., Bloomfield, NY 14469.

AWA official business: Bruce Roloson (President), 2577 Rittmer Ln., Seneca Falls, NY 13418.

Annual conference business: William Fizette (Second Vice President), RD 1, Box 55, Henryville, PA 18332.

Financial reports: Dexter Deeley (Treasurer), 8 Briar Circle, Rochester, NY 14618.

AWA NETS (EST)

PHONE:

Sun. 7247 kHz SSB, noon (NCS N4FS)
3837 kHz, QRP & AM, 5 PM, Nov. thru April (NCS: W2ICE & AA2CU)
Tues. 14274 kHz SSB, 2:30 PM (NCS: KC3YE and W0FXY))
3837 kHz SSB, 8 PM (NCS N4FS)
Mon.-Wed.-Fri. 3867 kHz, 9:30 AM (NCS W2ICE and W2SHN)

CW:

Daily, 4 PM, 7050 kHz (NCS varies)
First Wed. of each month, 8 PM, 7050

2-M REPEATER (Rochester area):
Mon., 7:30 PM (NCS: W2ICE)
Receive 146.820; transmit 146.220

FROM THE EDITOR

Ludwell Sibley, KB2EVN

THIS ISSUE

This wasn't planned as an "international special" issue, but that's how the contents added up - from Peter Yanczer's lead story on TV development in Europe to Louis Meulstee's photo feature on Eastern Bloc communications gear, with Canadian, Swiss, Austrian, etc. features in between.

R1155 INFORMATION

The question came up at the Bloomfield meet: is the info package on the RAF R1155 receiver, announced in the Aug. 1991 *OTB*, still available? Yes, five copies remain. The package is a restored original-size schematic, 8" x 24", marked with parts values, and several pages of supporting text. "While they last": send a large (9" x 11") SASE with 52¢ postage to your friendly editor.

MRL SWAMPED - STAND BY

Modern Radio Laboratories has gotten unexpected publicity lately, via at least three laudatory stories in the collector press, the February *OTB* included. Since the place is lightly staffed, a sizable backlog of catalog requests and orders has developed. Paul Nelson, the proprietor, indicates that he is pushing to get everything cleared up but asks customers for patience.

AWA PUBLICATIONS INDEX UPDATED

An up-to-date index of all AWA publications since 1960 is available on DOS disc as one large ASCII file. It can be searched - with amazing speed - using almost any DOS-based word processor (Word, Multimate, Word Perfect, etc.). For a copy, send $1.67 in loose U. S. stamps to the editor (other arrangements are available for foreign users). Specify 3-½", 5-¼" DSDD (360K), or 5-¼" DSHD (1.2-meg) format.

THE COVER

This television receiver was built by Peter Yanczer from one of two mirror screws located at the 1987 AWA Conference. Each gives a 120-line picture, 7" wide and 6" high. The one shown is made of aluminum. The other is made identically, but of stainless steel. The latter, dated 1934, was found still in its shipping box. The screws appear to be American-made, but the maker is unknown.

Each was set up with a 0.1-hp, 1200-RPM synchronous-motor drive in a cabinet as shown. The design is based on a photo of a German Traub receiver of the mid-'30s. (See Fig. 4 in the article on mechanical TV displays in this issue.) The motor is mounted vertically with the screw attached to its shaft. The motor body is connected to the knob protruding through the cabinet front just below the speaker. Rotating the motor body then adjusts the horizontal framing. Besides the television apparatus and speaker, the cabinet contains an amplifier for the sound channel. *Photo: Peter Yanczer.*

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AWA NEWS

CALENDAR

Aug. 4-7	ARCI RADIOFEST, Elgin, IL
Aug. 18	NFWA-AWA meet, Amherst Mus., NY
Aug. 21	SCARS meet, Torrance, CA
Sept. 22-25	AWA Conference, Rochester, NY
Oct. 15-17	VRPS-AWA meet, Irving, TX
Oct. 23	HARPS show, Middletown, NY
Nov. 7	AWA annual bus. meeting, Rochester

OTB POLICY ON PROMOTING EVENTS

You get the info to us, and we'll announce it.

For joint club-AWA meetings (with slide shows, etc.), please run the information in through Richard Ransley, the coordinator. For stand-alone club meetings, just get it in to the *OTB* editor - addresses on the inside front cover. Elegant format is not necessary; timeliness is. We don't want a nice printed brochure, too late to be used; we need the simple facts up-front. This section of the *OTB* is the last to close, about 4-½ weeks before the nominal date of the next issue. The exception is the November issue, which has to close (sorry!) September 15 because of the Conference.

After-action reports are welcome, for events that have been announced in the *OTB*. Being *news*, they should be sent in while still fresh.

RECURRING MEETINGS

Oklahoma Vintage Radio Collectors

Meets the second Saturday of each month (Aug. 14: Novelty Sets Night; Sept. 11: Grebe Night with presentation by Jim Collings; Oct. 9), at Spencer's Barbecue Restaurant, NW 63rd and May Ave. in Oklahoma City. Dinner and socializing starts at 6 PM, meeting at 7. Membership is $12 per year and includes the monthly *Broadcast News*. More info: SASE to OKVRC, PO Box 72-1197, Okla. City, OK 73172-1197; or call (405) 722-0595 or (405) 755-4139 eves.

New Jersey Antique Radio Club

Meets the second Friday of each month (Aug. 13, Sept. 10, Oct. 8) at 7:30 PM. A swapmeet is planned for October, to follow-up on the March and July events. Contact: send SASE to Tony Flanagan, 92 Joysan Terrace, Freehold NJ 07728, (908) 462-6638.

Delaware Valley Historic Radio Club

This new club in eastern Pennsylvania meets the second Tuesday of each month (e. g., August 10), at the North Penn Amusement Building, 105 Main St. (or Rte. 113), Souderton. The meeting includes an equipment auction. The DVHRC has grown to 63+ members and has held two Saturday swapmeets this year, with another planned for Fall. Membership is $5/yr. For details: PO Box 624, Lansdale, PA 19446, or Jay Daveler, (215) 368-2520.

California Historical Radio Society

Quarterly swapmeets in the Ampex Corporation parking lot in Redwood City (Aug. 7, Nov. 6). Gates open at 8:00 AM. Regional events: Fairfield swapmeet, Sept. 18 (contact: Paul Bourbin); Redding swapmeet, Aug. 10 and October (date to be chosen; contact Norm Braithwaite, [916] 246-4209). General address is CHRS, PO Box 31659, San Francisco, CA 94131; 24-hour voicemail info: (415) 978-9100). (Info from Mike Adams)

Mid-Atlantic Antique Radio Club

Meets monthly at the New Hope Seventh Day Adventist Church in Burtonsville, MD. Sundays at 2:00 (August 15, Sept. 19), then Saturdays at 6:30 PM (Nov. 20, Dec. 18). Annual picnic in October. Contact: Lloyd Kendall, (703) 471-6143, or Joe Koester, (301) 725-4229.

Southern California Antique Radio Society

Quarterly flea market and lunch at the Velvet Turtle on Sepulveda Blvd. in Torrance, on the third Saturday of each third month (Aug. 21) Meeting at the Ramada Inn in Norwalk, Nov. 19-21. Information: Floyd Paul, (818) 242-8961.

ARCI RADIOFEST 1993

Wed.-Sat., Aug. 4-7

The Antique Radio Club of Illinois will present this event at the Holiday Inn, 345 River Rd., Elgin, IL 60123. Call (708) 695-5000 for reservations. Large general auction, contest, special exhibit, donation auction, presentations, hospitality room, awards banquet, Muchow and Motorola Museum tours, open-air flea market each day and more! Info: Jeff Aulik, 1708 Parkview Ave., Rockford, IL 61107; (815) 399-1902 evenings or weekends. (JA)

NFWA/AWA NEW YORK MEET

Saturday, August 14

The Niagara Frontier Wireless Association will hold its annual meet at the Amherst Museum, near Buffalo, NY, 8:30 AM - 3:00 PM. There will be a large antique-radio flea market, equipment contest, two auctions, and a program on early radio. Contest categories are: • Any radio speaker; • Radio with separate matching amplifier; • AC tube radio; and • Novelty radio (tube or transistor). Auctions will be as last year, with a tailgate auction for personal items and a donation auction for items contributed to support NFWA. Exhibits

will cover rare locally made Federal radios and parts, Federal's station WGR, a 1920s radio repair bench, etc. - see the Museum News on page 60.

Coffee, soda, and doughnuts will be available. Fee: $2 per person (no extra fee to sell). The museum may be reached from Exit 49 of the NY State Thruway. Take Rte. 78 (Transit Rd.) north nine miles. Just before entering Niagara County, turn west on Tonawanda Creek Rd. and go west two miles to New Rd. (Stay on the south side of Tonawanda Creek in Erie County.) (Larry Babcock)

AWA CONFERENCE - ROCHESTER

Wednesday-Saturday, Sept. 22-25

Thruway Marriott, near Rochester, NY (in uncongested Henrietta). See yellow centerfold for full details.

For the Radio Collector's Slide Show on Thursday: Members wishing to participate in the latter should send 35-mm slides to Lauren Peckham at Box E, Breesport, NY 14816 by September 14. Here's a chance to share your favorite set or latest find - anything from battery models to transistor sets! Slides will be returned.

Those flying to the event may be interested in discounts on air fares. Traveltime Travel in Rochester is the "official" airline agency for the Conference, offering discount fares on most major carriers. Contact personnel are Peter Hahn or William Jones, on (716) 271-2500 or (800) 836-1131, fax (716) 461-5446.

Donations of equipment to be auctioned to support maintenance of the AWA Museum are avidly invited . . . please see p. 63 for details.

TEXAS MEET

Friday-Sunday, Oct. 15-17

The Vintage Radio & Phonograph society will hold its annual mega-event in Irving, TX, with two auctions, large equipment contest, and swapmeet. For details: Chevy Crandell, (214) 337-2823.

NEW YORK MEET

Saturday, Oct. 23

The fourth annual "Old Time Radio & Phonograph Show" will be held 8 AM - 4 PM at a new location: the Holiday Inn Middletown, Exit 122 off Route 17, Middletown. This will be an all-indoor show, with $1 admission charge for the public and refreshments available. Sponsored by the Hudson Valley Antique Radio & Phonograph Society, the show will feature demos of antique equipment several times during the day. Items expected to be available include console and table radios and phonos, advertising, parts, manuals, books, and related collectibles. For more info: Gramm-O-Phone Antiques, (914) 427-2602 (ask for John or Linda) or Victorian Talking Machine Co., (914) 561-0132 (ask for Geoff or Judy), 6 to 9 PM.

HARPS has recently elected new officers: Art Kingsley, president; Joe Botta, VP; Gary Berg, secretary, and Linda Gramm, treasurer. Founded in 1991, the club holds monthly meetings. For details, see the first phone contact above, or PO Box 207, Campbell Hall, NY 10916. (HARPS)

SERVICE SOURCES AVAILABLE

The "AWA Source Sheet," a listing of parts suppliers and services for the radio collector. Cost: only a business-size self-addressed stamped envelope, to AWA, Box E, Breesport, NY 14816.

NOMINATIONS FOR AWA AWARDS

A reminder: there are just a couple of days left to nominate potential recipients of the AWA Houck, Taylor Television, and Tyne Tube awards. As detailed in the May *OTB*, inputs to the awards chairmen are due August 1, or, for the BK-OTB Award, August 7. Write your letter *now*!

HAMMOND NAMED HONORARY MEMBER

The AWA Board has elected Fred Hammond, VE3HC, an honorary member. This recognizes his long-standing support of AWA events and activities (for a recent example, see the Canadian Meet story in the November *OTB*). Our congratulations!

NEW AWA VIDEO SHOW AVAILABLE

The AWA library of video programs for cooperative meets includes a new title: V-12, "Magazine Covers," prepared and narrated by Bruce Kelley. It tells a "story through covers," including such catalogs as Radio Enters the Home and magazines like *Radio Broadcast*, *QST*, *Radio News*, *Popular Radio*, and *Radio*, accompanied with '20s background music. A nice nontechnical "nostalgia" program that any group can enjoy. For details on borrowing, see p. 7 of the May *OTB*.

It has been decided to require deposits to encourage the speedy return of borrowed materials: $15 for a videocassette, $80 for a slide show. (Richard Ransley)

PROPOSED OLD-TIME AM PHONE NIGHT/CONTEST

Due to the interest shown in AM phone operation on the Sunday AWA phone net, we are considering an Old-Time AM phone roundtable and/or contest night. As a contest, this could be organized in a format similar to that of the OT CW contest, with multipliers for OT equipment and low-power operation. The 3867-kHz net frequency is under consideration due to its proximity to the 75-m AM "window," but additional band(s) are a possibility. Further discussion of this proposal will take place at the amateur-radio forum to be held at 4 PM on Friday at the Conference. Keep it in mind for the Fall! (Bob Decker, AA2CU)

INNOVATIVE MECHANICAL TELEVISION

Peter Yanczer
835 Bricken Place, Warson Woods, MO 63122

If one mentions mechanical television, most readers will immediately have a mental image of a large disk rotating at high speed and providing a dim, small and coarse 24- to 60-line picture. Television began with scanning disks like one patented in Germany by Paul Nipkow in 1884. As work toward practical forms of television began in earnest, it was soon learned that the scanning holes passed very little light. Even in full sunlight, early cameras would not operate outdoors - there wasn't enough light. The same was true at the receiver, where the light source was a flat-plate neon lamp. The tiny holes in the disk allowed much less than one percent of the light from the lamp to pass through. It was really "lights-out time" when the televisor was switched on.

NIPKOW DISK

A bright picture would have been very welcome because it could then be enlarged by projection and any added brightness would have increased the apparent resolution. By increasing the diameter of the Nipkow disk, larger scanning holes could be used. This explains why disks tended to be from two to four feet in diameter. Sometimes lenses were added because these could pass much more light than the scanning holes. When lenses were used, their optical centers were located in the same place as the scanning holes in a Nipkow disk. Logie Baird of England once built a lens disk eight feet in diameter, with 30 lenses as large as bowling balls. He was almost killed once when some of the lenses came loose while this disk was in operation. They were flying around the room like large boulders and he wisely took cover.

MIRROR DRUM

An early improvement over the Nipkow disk was the mirror drum (see Fig 1.) For its size, it was the most light efficient mechanical scanner. In its original form, there were as many mirrors as there were lines in the picture, with each mirror tilted at a different angle relative to the axis of the drum. As it rotated, each mirror caused a line to be scanned above or below the previous one. Beyond 60 lines with mirrors of reasonable size, the drum became excessively large. The mirrors were also very difficult to adjust.

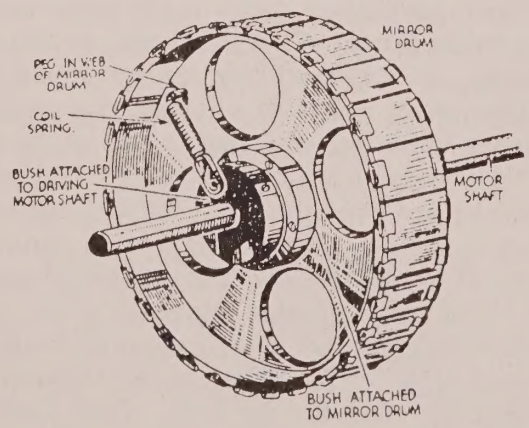


Fig. 1 - A mirror drum.

As photocell sensitivity and light sources improved, scanning-hole size or lens diameter could be reduced. This allowed the disk diameter to be reduced. Reducing the disk size resulted in a more compact scanning assembly. As an example, Western Television of Chicago produced a televisor with a 17-inch aperture disk and a flat-plate neon lamp. It provided a 45-line picture, 1-1/8 by 1-1/2 inches. The following year (1931), they developed a new 45-line model with an 8-inch diameter lens disk, providing a much larger and brighter picture, measuring 4 by 3-7/8 inches. The improvement was due to the use of both the lens disk and a more efficient light source, a crater-arc neon lamp. This new model included an 8-tube receiver, which the previous model did not, and the complete receiver occupied only about half the table space as before. From this time on, there was a major effort by those involved in the mechanical-television business to develop small, low-cost scanners that would produce large, bright pictures with improved resolution. Meanwhile, there was constant pressure to increase the number of lines in the image. However, this tended to increase the size of the scanning assembly. Commercial television started with 24-line pictures, mostly because of the bandwidth limitations of transmitters operating in or just above the broadcast band. As the transmissions were allowed to move up in frequency, more lines could be added to the image, improving image resolution. With pictures up to 60 lines, scanning disks with holes, lenses or mirrors could provide acceptable pictures with disks of reasonable size. Beyond that (and the next step was 120 lines), the holes, lenses or mirrors became too small or the disk too large and the requirement for manufacturing precision too great for scanning disks to see further use in receivers. By 1932, the Nipkow disk had had its day. This was also the end of the "low definition" era of television. With 60 lines (or fewer), television images were limited to close-ups of actors or scenes with large recognizable objects. At 120 lines and more, television took on movie-like qualities, with "long shots" as well as close-ups, where the scenery added to the impact of the actors. This was the beginning of high-definition television (HDTV), and some very

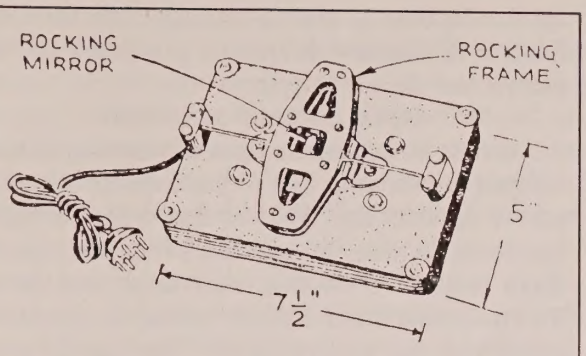


Fig. 2 - A vibratory scanner.

innovative ideas were tried to make it happen. Early efforts to develop small mechanical scanning assemblies tended to fall into two general categories: vibratory scanners and rotating scanners.

VIBRATORY SCANNERS

One of the early attempts at developing a small mechanical scanner was the vibratory scanner (Fig. 2). In this device, a small mirror "rocked" in the horizontal direction and simultaneously in a vertical direction, perpendicular to the first. The mirror, usually about 1/4" square, was controlled by a pair of electromagnets driven by appropriate sweep-signal frequencies. To improve the efficiency of the scanner, the mirror mounting was made resonant to the two sweep frequencies. A light source, modulated by the picture signal, was reflected by the vibrating mirror onto a screen. Pictures as large as three feet square and with up to 240 lines were claimed with this system.

The main failing of the vibratory scanner was that it produced a sine-wave scanning action, not compatible with signals from cameras equipped with the usual Nipkow disk or electronic pickup tube such as the image dissector or iconoscope. In addition, sine-wave scanning produces undesirable shading of the image. Similar scanners were attempted using piezoelectric crystals or electrostatic drivers instead of electromagnets. They suffered from the same problems.

ROTATING SCANNERS

The three most innovative and successful mechanical scanners were:

- The mirror screw (up to 180 lines)
- The Milhaly-Traub scanner (up to 405 lines)
- The Scophony system (up to 441 lines)

MIRROR SCREW

The typical mirror screw consisted of a stack of identical long, thin, narrow mirrors made of aluminum or stainless steel (Fig. 3). Each had one of its long edges polished to a mirror finish. The stack of mirrors were set on a central shaft and positioned in the form of a spiral staircase. The total number of mirrors was the same as the number of lines in the picture. Each mirror was displaced in angle from the mirrors above and below and the angles were all equal. In a 120-line mirror screw, each mirror would be accurately positioned 3 degrees from the previous one, so that the 120 mirrors formed one complete spiral. The thickness of each mirror would be the same as the picture-line thickness and the mirror length, the same as the picture width. Therefore, the height of the mirror stack would be the picture height. Other than the polished edges, the entire exposed surfaces of the mirror slats are painted with a non-reflecting dull black paint. The mirror screw always operated in total darkness with the signal-modulated light source pointed at the screw, but located near the viewers.

When the mirror screw rotates at picture frequency (say, 20 times per second), the stack of mirrors appears to run together and become a single mirror, as tall as the stack and as wide as the individual mirrors. A narrow line of light with its width the same as the mirror-slat thickness and as tall as the stack of mirrors falls on the screw from a location beside the viewers. The intensity of this light is modulated by the picture signal. As this light falls on the topmost mirror, the mirror reflects a square spot of light toward the viewers. This spot is formed by the width of the light source and the height of the mirror slat reflecting it. Because the mirror is rotating, the spot appears to move across the mirror screw. This represented one line scan and three degrees of rotation. Very quickly, the mirror below moves into position, receives the light source and performs its line scan. And so on with all the other mirrors in turn until one revolution of the screw is complete. This comprises one complete picture and the mirror screw

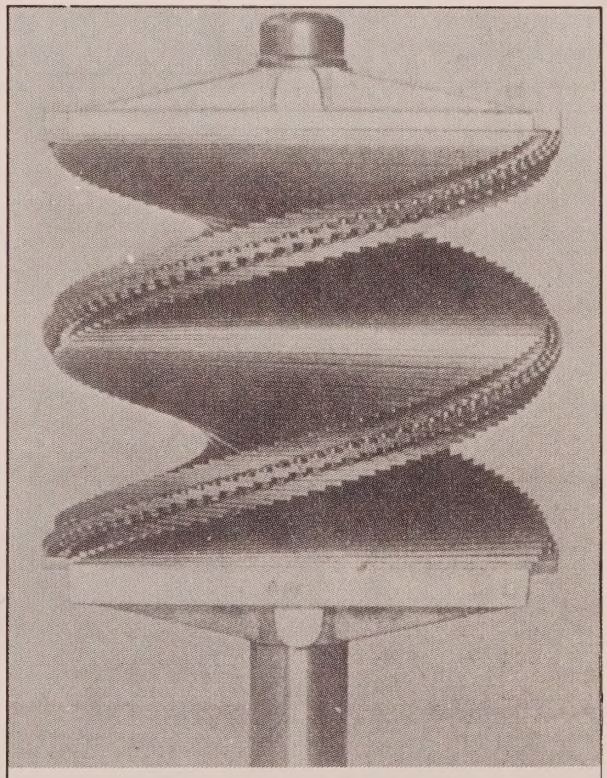


Fig. 3 - A mirror screw for 90 lines.

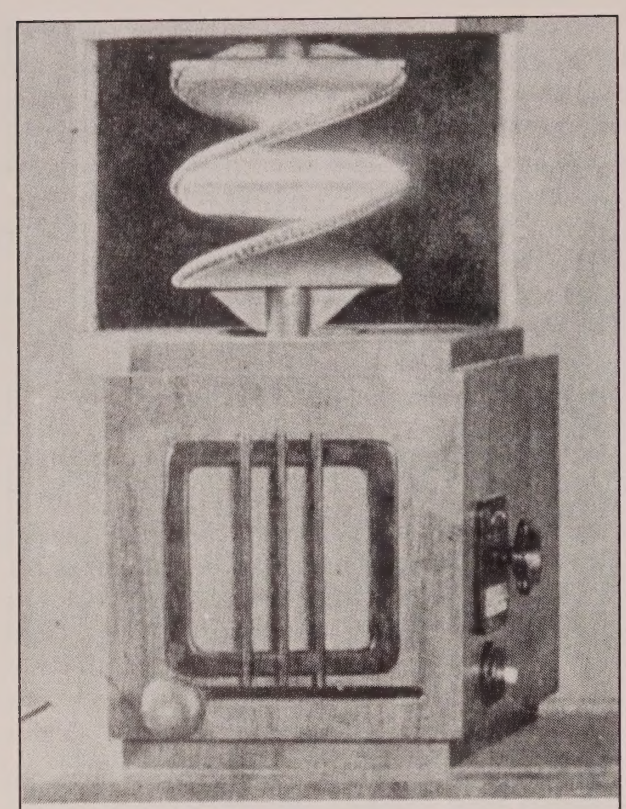


Fig. 4 - A 180-line mirror-screw receiver.

is then ready to begin scanning the next picture.

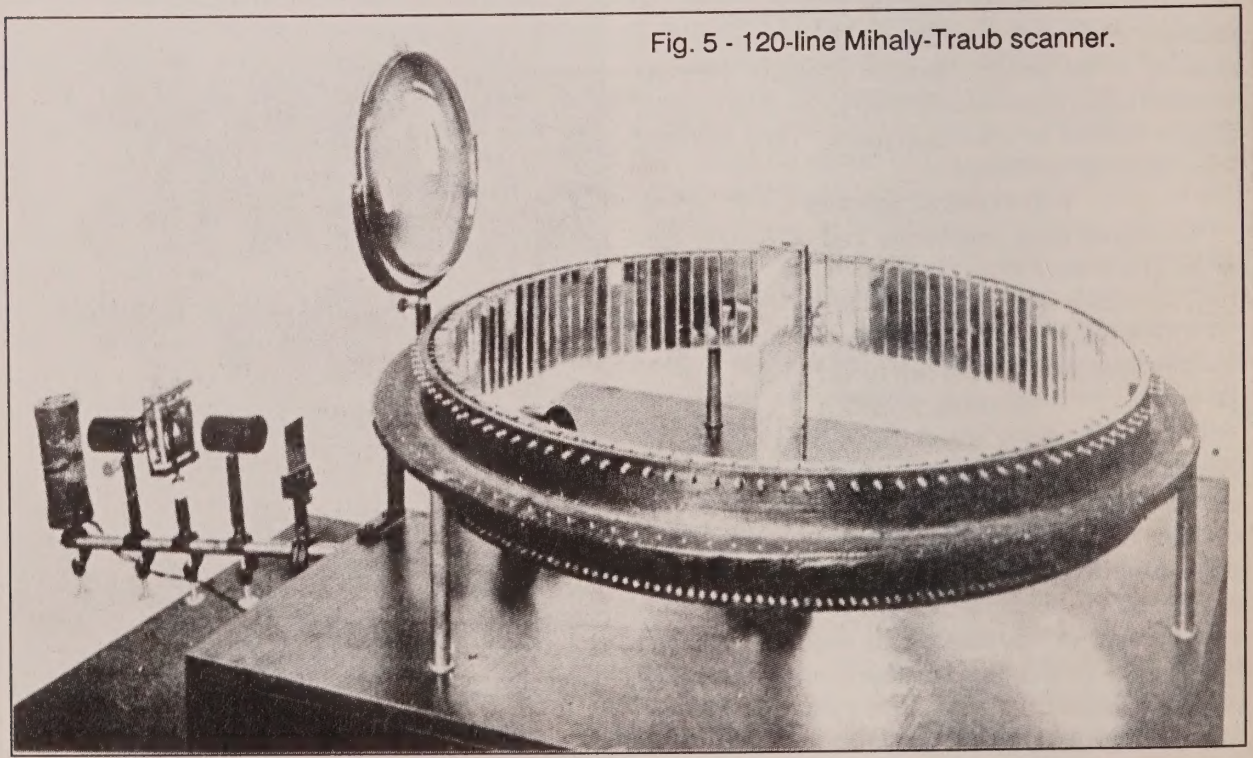
The mirror screw was a major improvement over previous scanning methods. The advantages of the mirror screw were its light efficiency, compactness, picture size equal to its height and width, capability of high resolution (for its time) and a wide viewing angle. A typical mirror screw might be approximately six inches high and seven inches wide. Some 180-line mirror screws manufactured in Germany measured 9" by 12" (Fig. 4). For a Nipkow disk to show a 180-line, 9" by 12" picture, it would have to be over 53 feet in diameter. On the other hand, a 12" Nipkow disk would produce a 180-line picture less than 1/4" square.

MIHALY-TRAUB SCANNER

Another innovative method of scanning was developed to overcome two of the major problems of mirror drums. The first was that with the higher line rates, so many mirrors were required that the drum tended to become very large and heavy. This made the drum difficult to keep in synchronization with the picture signal. The second problem was that the tilt adjustments on each mirror required special tools and had to be made with the drum stationary. With the higher line rates, the adjustments became so critical that many attempts had to be made before a satisfactory adjustment could be achieved. This problem was compounded by the condition that with the drum operating at speed, centrifugal forces on the mirrors caused them to shift out of their preset positions as long as the drum was revolving.

The Mihaly-Traub scanner was basically a mirror drum turned inside out. In its original form, it consisted of a ring of stationary mirrors (one for each line), all facing inward (Fig. 5). Each mirror had tilt adjustments, just like those on a mirror drum. In the center of the ring was a motor-driven mirror, silvered on both sides. It rotated at half the picture rate. A beam of light, modulated with the picture signal, was directed under the mirror ring to the lower part of the rotating mirror. From there, the light reflected to one of the mirrors in the ring, back to the upper part of the rotating mirror, and then over the top of the ring and on to the screen. The rotation of the center mirror threw the beam of light onto one stationary mirror

Fig. 5 - 120-line Mihaly-Traub scanner.



after another. As the beam swept across each mirror in the ring, a corresponding scan line was focussed on the screen. Because each mirror had a slightly different tilt from the ones before and after, the scan lines were traced on the screen, just above or below the previous one. Each rotation of the center mirror formed two complete pictures on the screen. The double reflection from the rotating mirror was an ingenious feature of this scanner. Another was that the stationary mirrors could be adjusted while the scanner was operating.

With the original Mihaly-Traub scanner, a stationary mirror was required for each line scanned. At some point, it was determined that the number of lines scanned was actually the product of the number of stationary mirrors times the number of rotating mirrors. Changing the rotating mirror to a six-sided one would allow the stationary mirrors to be reduced by a factor of three. Furthermore, they would remain the same size as before, but occupy only one-third of the circle (120°), meaning a further reduction in the size of the scanner. The central mirror, now rotating at picture speed, had its six sides set at slightly different vertical angles. As one of these mirrors swept around, it scanned a group of lines, the same as the number of stationary mirrors. The next central mirror, with a slightly different tilt, began its group of lines where the previous ones left off and so on with the remaining mirrors.

A typical scanner would have the stationary mirrors located on a 4" to 6" radius around the rotating mirror. In the center would be a rotating mirror assembly with four to ten sides. A scanner for 120-line transmissions might have a six-sided rotating mirror working with 20 fixed mirrors in a 120° arc. Another design could use an eight-sided rotating mirror with 15 fixed mirrors in a 90° arc (Fig. 6). There are additional possibilities with center mirrors of 4, 5 or 10 sides, which you might work out as an exercise!

Because the image is projected on a screen, picture size is limited only by the amount of modulated light available. The advantages of the Mihaly-Traub scanner are similar to those of the mirror screw, but with the additional advantage of requiring a very small motor for the rotating mirror. This scanner was operated successfully on 405-line systems.

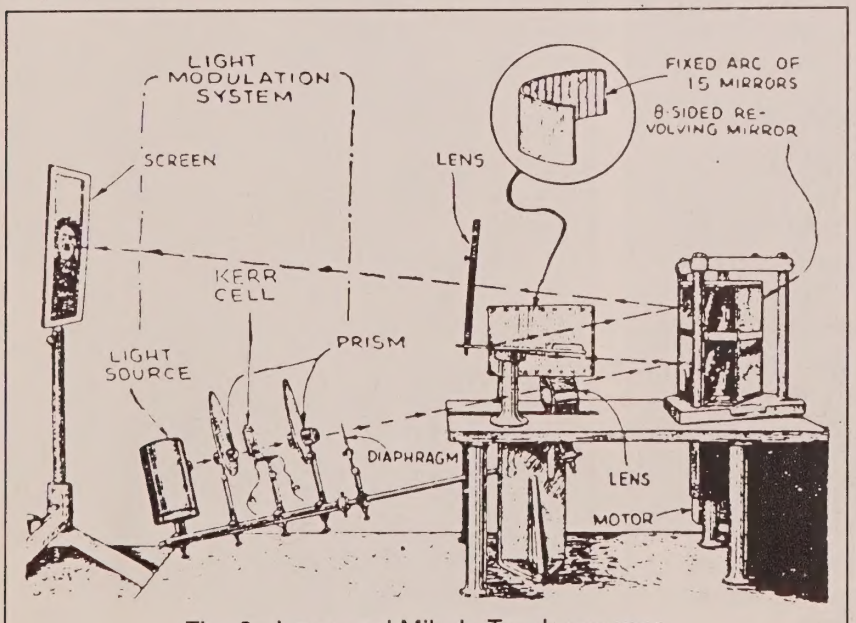


Fig. 6 - Improved Mihaly-Traub scanner.

THE SCOPHONY SYSTEM

The English Scophony system is probably the most interesting, and the least known, of the scanning methods described here. This is in spite of the fact that, without a doubt, it provided the highest performance ever achieved with mechanical scanners.

In 1938, Scophony successfully demonstrated 405-line mechanical television receivers of three types at the annual Radiolympia show in England. One was a cabinet-mounted home receiver that produced a picture approximately 24" by 22". The other two were of similar construction, but without cabinets, intended for theater-type operation. One produced a 6- by 5-foot picture (Fig. 7) and the other, 9 by 12 feet. Several of the theater models were installed and operating successfully. A receiver designed for the home is shown in Fig. 8, and its optical chassis in Fig. 9. None of these receivers were sold; their production was halted due to the oncoming war in Europe.

The Scophony system consisted of several unique innovative devices working together. It used a new "split-focus" optical system coupled to a "Jeffree Cell" light modulator and special high-speed synchronous motors to drive the scanners. Each was an important, fundamental Scophony invention, developed by them for their mechanical scanning systems.

The split-focus optical system invented by G. W. Walton was developed specifically for use with mirror scanning systems. Focussing of light beams was accomplished by crossed cylindrical lenses, concentrating the light in two planes. This technique allowed the efficient use of smaller lenses and mirrors in the optical system, thereby reducing size and cost of the scanning equipment. This was especially important to Scophony because of their intent to produce very large picture sizes, normally requiring large and costly optic elements.

The Jeffree cell was the light

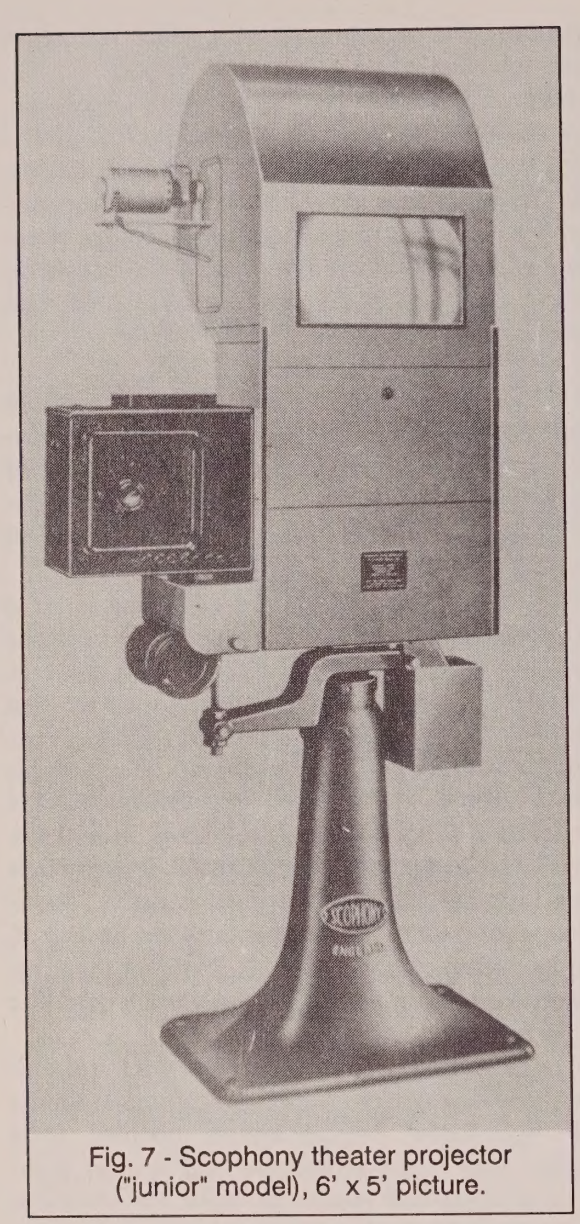


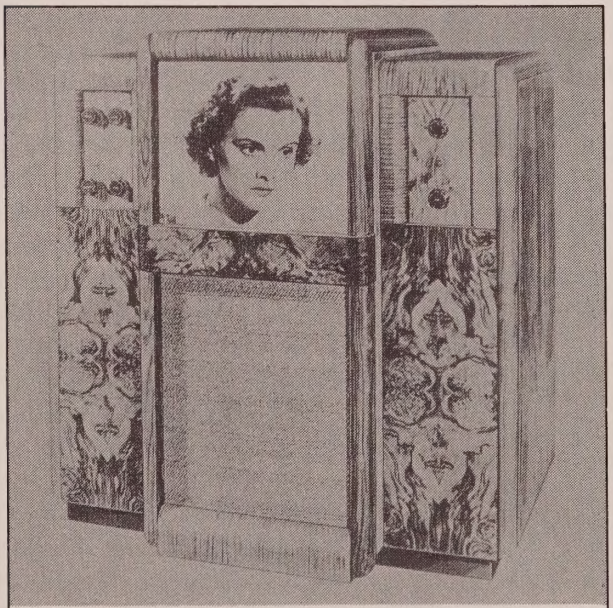
Fig. 7 - Scophony theater projector ("junior" model), 6' x 5' picture.

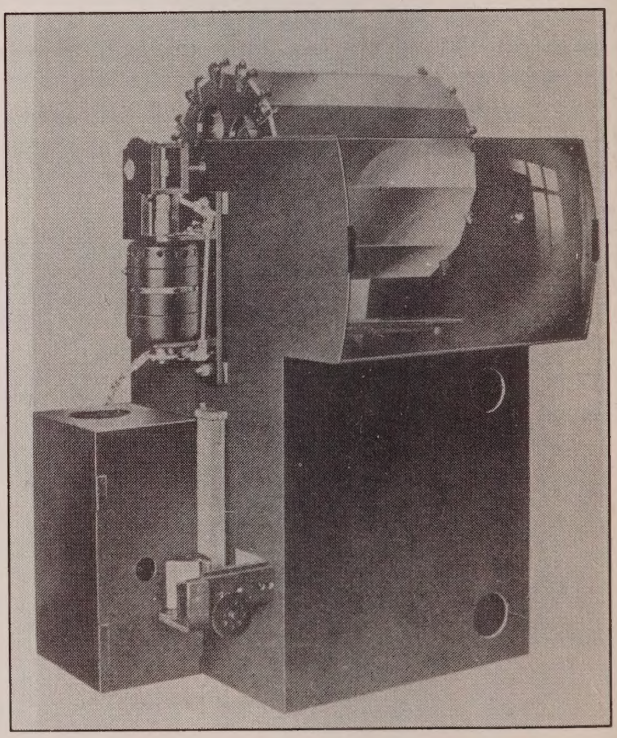
modulator used in the Scophony system. Developed by J. H. Jeffree in 1934, it was a major improvement over the Kerr cell, both in efficiency and ease of operation. As much as 200 times (not percent) more modulated light was available at the screen. Its principle of operation was that, as a supersonic mechanical oscillation passes through a transparent fluid in which a beam of light is also passing, a series of retardations and accelerations of the light beam will occur. These oscillations, properly controlled, can cause selective cancellation of the light waves passing through the fluid. Optical devices using the same principle of operation as the Jeffree cell have been "re-invented" in recent years for applications in television and lasers. This was a device well ahead of its time.

The Scophony system used two mirror drums (Fig. 10), one as a low-speed scanner with 12 mirrors operating at approximately 240 RPM. A high-speed scanner with 20 mirrored surfaces ran at 30,375 RPM for a 405-line transmission. When set up for the 441-line system then used in America, the high-speed scanner turned at 39,690 RPM. These motors were good for at least 1000 hours of use and most went many times longer with no measurable wear. Considering that the year was 1938, this was an outstanding accomplishment. At the same time, Scophony was developing synchronous motors that could operate at 150,000 RPM.

The period between 1932 and 1939 was the "coming of age" for television. In England and European countries, television as a service was developing to the point where program content was becoming more important than the novelty of the medium. These years were also the "coming of age" for mechanical systems, and innovation was the rule. During these years, mechanical television offered many advantages over

(Continued on p. 20)





Figs. 8 (above) and 9 (right). Scophony television receiver (22" diagonal picture), and its optical chassis.

SOME SOVIET AND EAST GERMAN MILITARY RADIOS

Louis Meulstee, PA0PCR
28 Smetanalaan, 3122 HP Schiedam, Holland

Tactical military radios have been reaching the hands of equipment collectors in Europe from the former Eastern Bloc countries. Here are some excellent, brand-new photos of these sets from a veteran writer on historic military electronics. - Ed.

Soviet HF transceiver R-104M, shown in the photo with German inscriptions, was designed in the 1950s and used in East Germany. The set is suitable for CW and AM voice, operating from 1.5 to 4.2 MHz in two ranges. Used as a man-pack set having three-watt RF output, it was carried as a two-man load (the set and its storage battery - low power supply unit, interconnected by a strong cable). In a vehicle, usually the ubiquitous GAZ 69 Soviet jeep, or as a ground station, it had an additional external power-supply unit allowing 20-watt RF output. Shown in the picture is a ground/ vehicle installation. The R-104M is in the center with antenna tuner attached, low-power supply unit-storage battery pack at left, and external high-power supply unit at extreme left. The lid of the low power-supply unit - battery pack forms a mounting for the Morse key.

Soviet HF receiver type R-326 is a portable set covering 1 to 20 MHz in six ranges. It replaced the type R-311 receiver. The receiver is self-contained with internal rechargeable Ni-Cad batteries. Use is made of battery tubes (except two transistors in the high-voltage inverter). A more recent model, the R-326M, is fully transistorized and has a digital readout. The accuracy of the projection-type scale (the rectangular window on top of the front panel) is remarkably good. A very effectively bandwidth control allows variable adjustment between 300 Hz and 6 kHz.

Standard Soviet man-pack transceiver type R-105M was one in a range of three virtually identical VHF FM transceivers covering 20 to 46.1 MHz. The R-105M had a range of 36 to 46.1 MHz; 21.5 to 28.5 was covered with the R-109M; while the R-108M operated from 28.5 to 36 MHz. The sets replaced an earlier range of VHF FM sets types R-105D, R-108D and R-109D. The R-105D is a hybrid development using "pencil" type battery tubes and transistors; the RF output is one watt. Use is made of printed circuits. The set is powered from internal Ni-Cad batteries.

East German HF receiver type EKB (Empfänger Kurzwelle Batterie, or Receiver, Shortwave, Battery). In an attempt to produce military radio equipment in the home country, the model EKB receiver was made in the early 1960s. It covers a tuning range of 1 to 22 MHz in six bands. A hybrid design uses miniature battery tubes for the RF stages and transistors in the IF and AF stages. The set is self-contained with a removable rechargeable Ni-Cad battery pack. In operational use it was either carried as a backpack or mounted in a vehicle.

Soviet HF receiver type R-311, developed in the mid-1950s, was in widespread use throughout the Soviet and Warsaw Pact countries. Although designed as a man-pack or ground set, it has been much used as auxiliary receiver in radio vehicles. The frequency range of 1 to 15 MHz is covered in five bands. Much of the set's internal space is taken by a huge rotating coil block. A Ni-Cad battery, placed in a partition in the rear of the case, drives a synchronous vibrator power-supply unit. The vibrator PSU can be replaced by a high- and low-voltage dry battery which fits into the compartment normally occupied by the PSU.

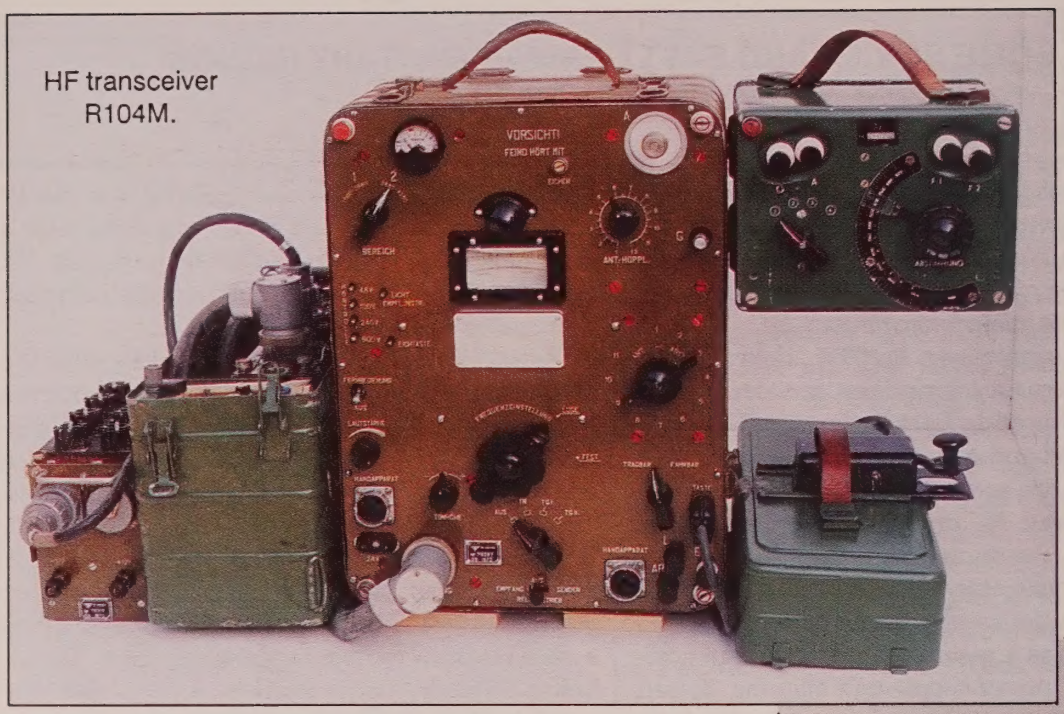
East German HF SSB transceiver type SEG 15D was made in large quantities in the 1970s and is said to have been sold throughout the world, including North Vietnam. It is fully transistorized, having 15-watt RF output power. The set was used in various roles, including a man-pack version with a seven-foot whip antenna directly mounted on the set's front panel. By means of four switches the frequency can be set between 1.5 and 12 MHz in steps of 1 kHz.

Soviet VHF FM transceiver R-107T is a man-pack set replacing the R-105/8/9 D-M series and the tube-type R-107. It covers 20 to 52 MHz in two ranges. This model is fully transistorized, having an RF output of 1.3 watts. The set in the photograph has German markings and was used by the East German NVA (Nationale Volks Armee, or National People's Army). A more recent development of the set, type R-107M, has a digital readout. The set is powered by internal Ni-Cad batteries.

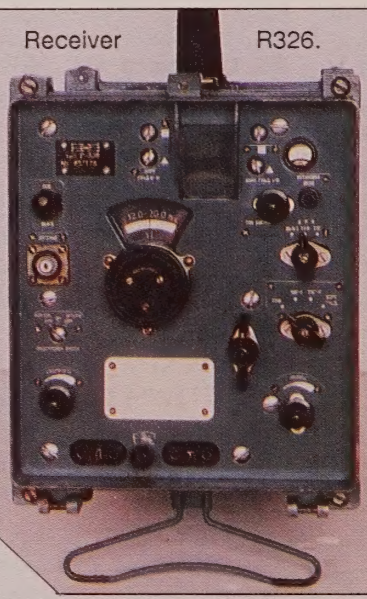
Soviet VHF FM man-pack transceiver type R-126 (not pictured) was the smallest set of the 1960s and 1970s. It was used primarily for communication at platoon to company level and replaced the R-106, a slightly larger VHF AM set. The set has a variable tuning range covering 48.5 to 51.5 MHz, providing 31 channels with 100 kHz spacing. It is powered by two 1.5-volt rechargeable silver-zinc batteries, which when fully charged give 16 hours working. Use is made of miniature "pencil" type battery tubes; the high-voltage inverter uses a pair of transistors. A circular cover on the front of the set protects the tuning control and dial against dust and moisture.

All photos: Anton Meulstee

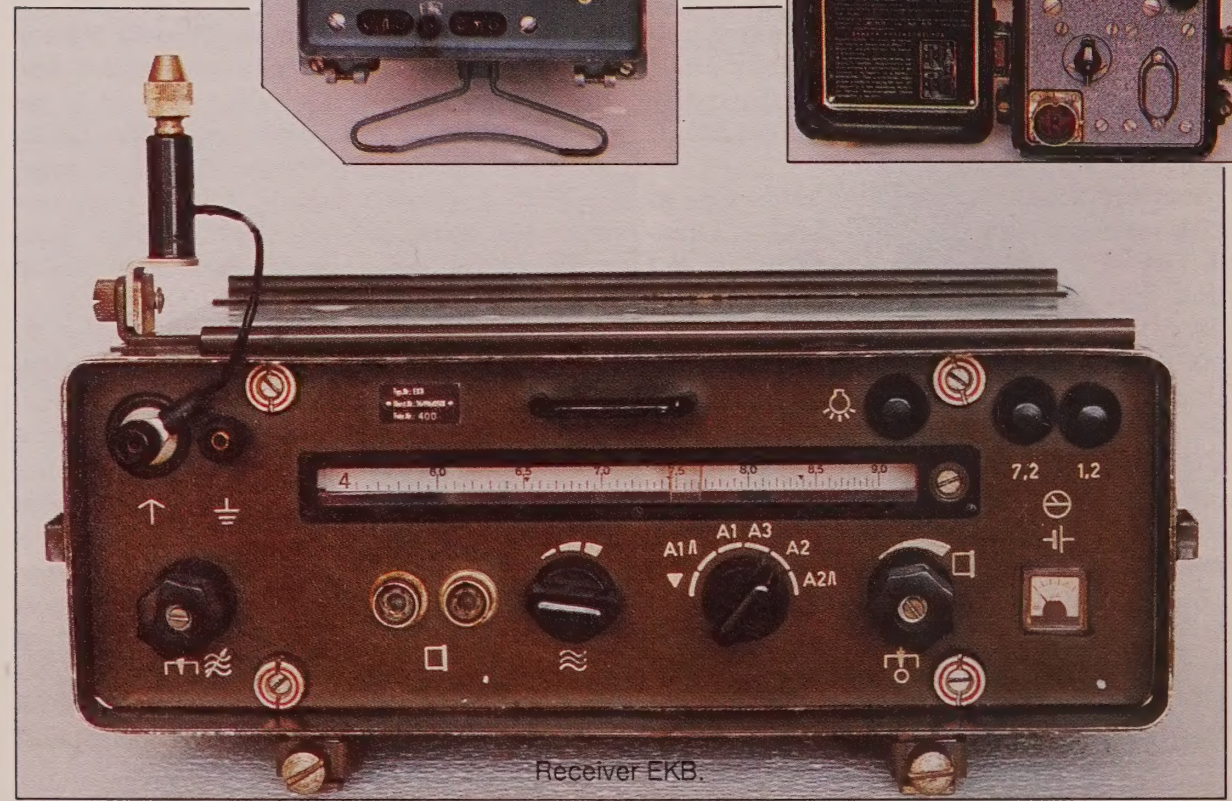
HF transceiver
R104M.



Receiver R326.

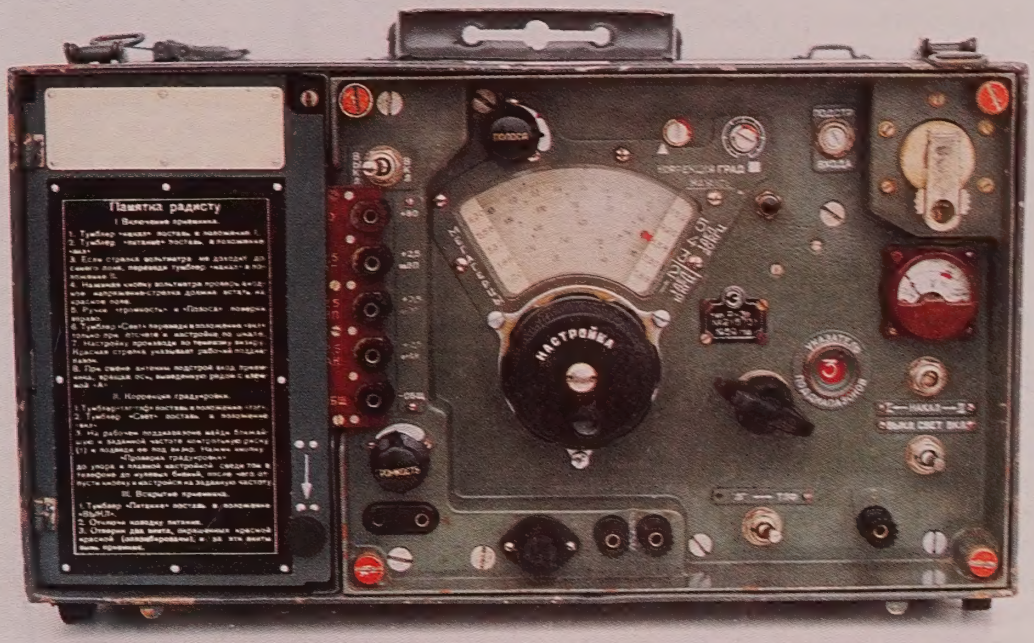


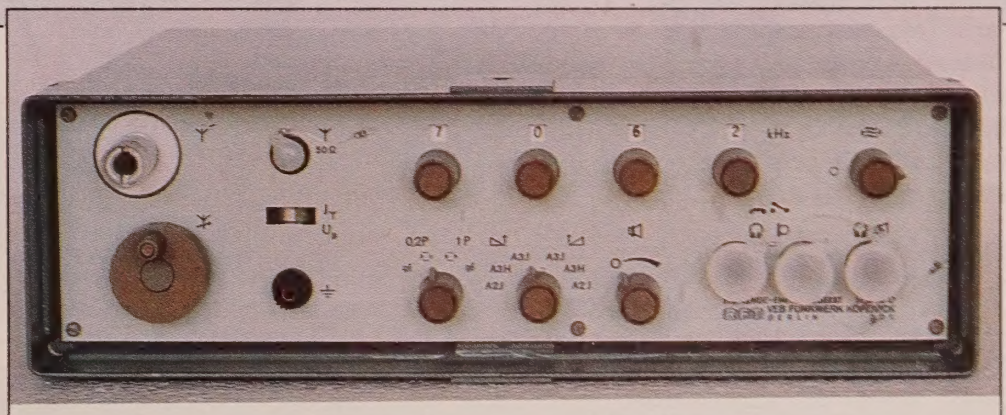
VHF transceiver
R105M.



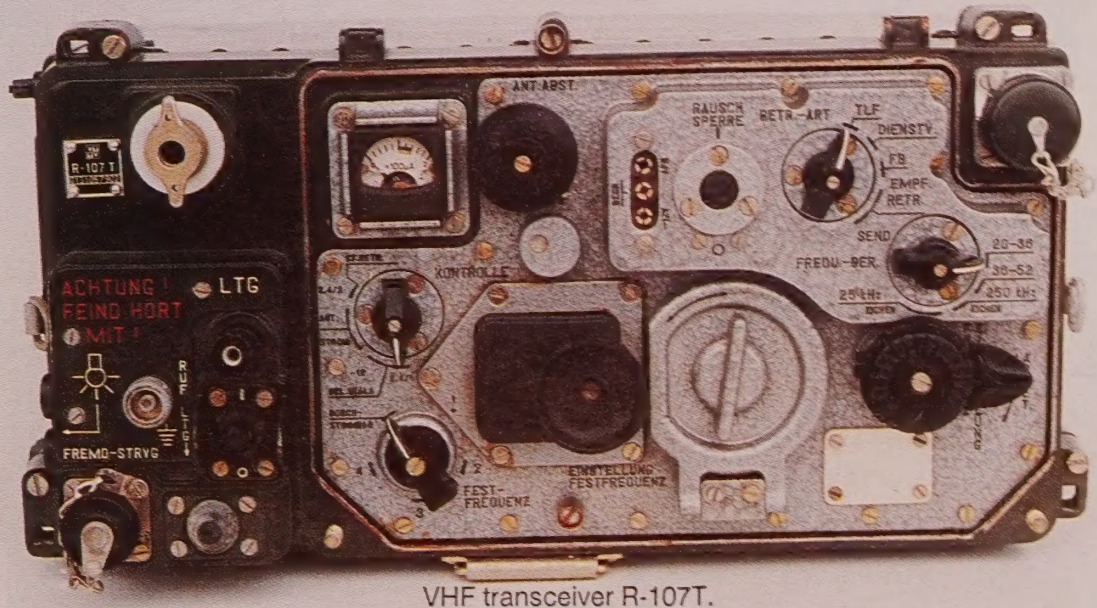
Receiver EKB.

HF receiver R311.





HF SSB transceiver SEG 15D.



VHF transceiver R-107T.

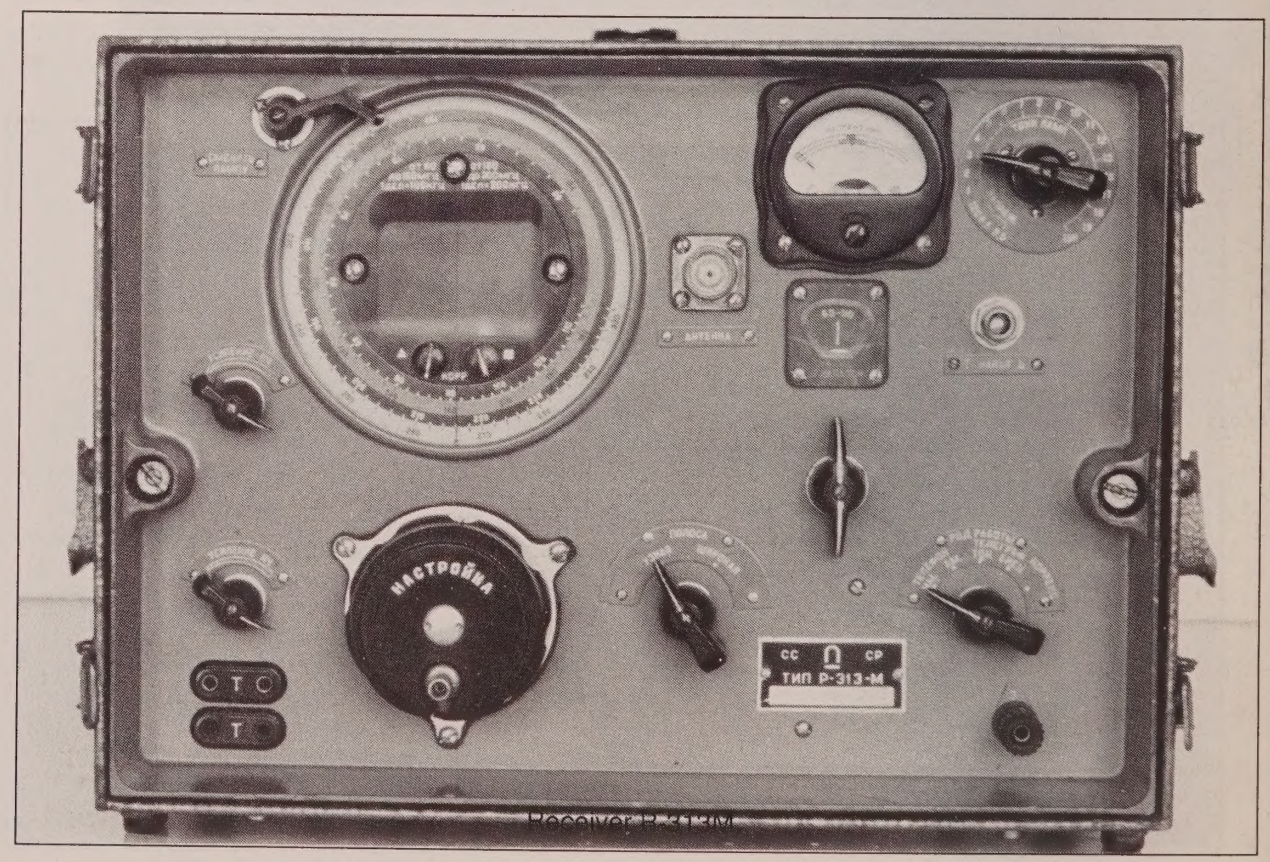
Note the red inscription *ACHTUNG - FEIND HÖRT MIT!* (ATTENTION! THE ENEMY IS ALSO LISTENING!).

Also, two late arrivals:

Soviet VHF-FM transceiver type R-392 (not to be confused with the U. S. R-392/URR!) is a man-pack apparently developed in the early 1980s. It has six fixed channels: 44.3, 44.6, 44.9, 45.2, 45.5, and 45.8 MHz. The channel selector atop the set is normally covered with a circular cover like that used with the R-126 transceiver. The set has an RF output of about two watts and is powered from a 9.6-V Ni-Cad. In operation the set is carried in a canvas carrier strapped to the operator's back. It uses a single headphone with a cheek microphone, connected to the set via the control unit.

Soviet receiver type R-313M is a VHF intercept set operating from 60 to 300 MHz. Developed in the early 1960s, it is the third in a line of receivers ranging from 1 to 300 MHz (with the R-311, 1-20 MHz, and R-312, 20-60 MHz; both having a very similar general appearance and front-panel layout). The 60-300 MHz spectrum is covered in four bands, marked in red, yellow, green, and white on both the coil-turret indicator at right and the large coarse frequency scale at left. A more precise indication of the frequency is projected onto a frosted glass panel in the center of this scale. Tubes are used throughout, with a separate mains or vibrator power-supply unit connected at the rear of the set.

Transceiver R-392.

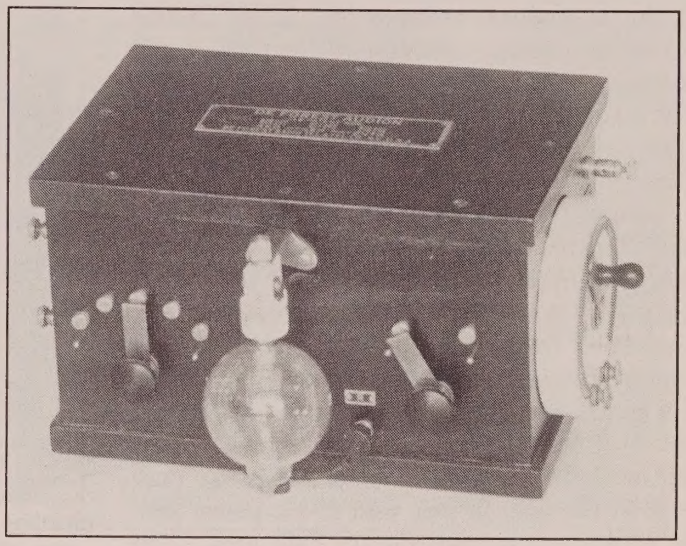


Receiver R-313M.

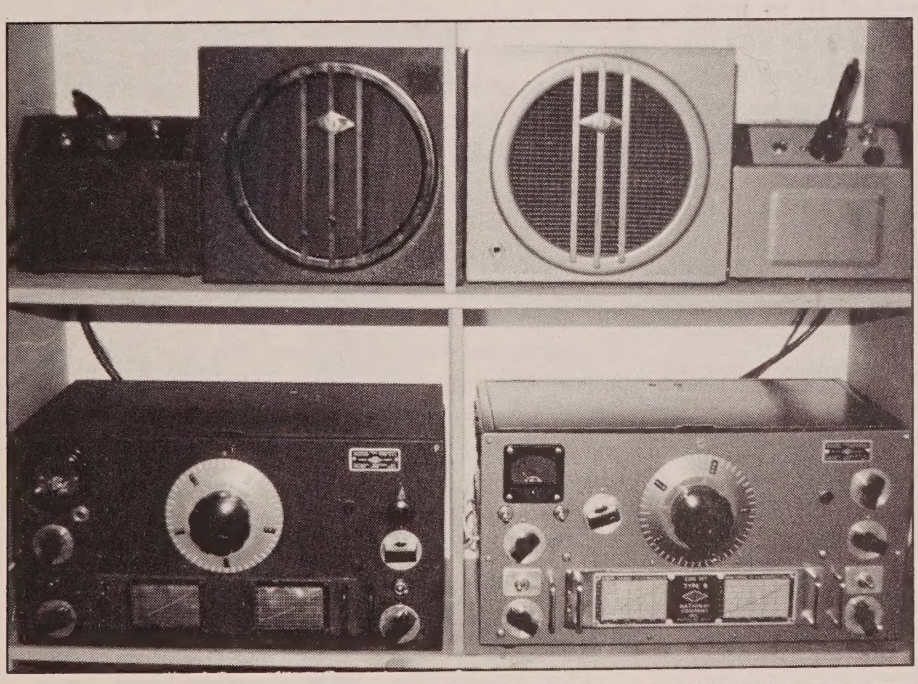
A SWISS COLLECTION

Photos from **H. Krüger**
Nelkenstrasse 2, CH-8304 Wallisellen/ZH, Switzerland

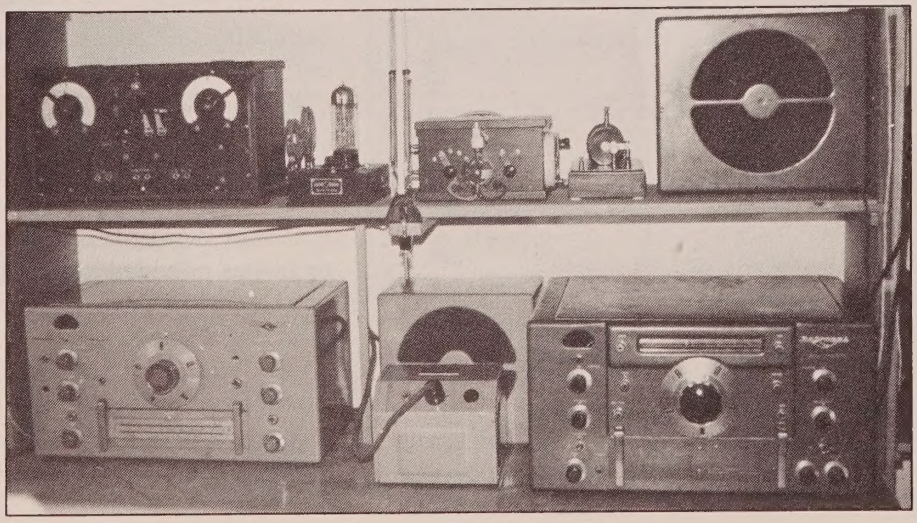
These pictures, and the one on the rear cover, represent part of the collection of Helmut Krüger. Items from the Twenties predominate, but the material covers much earlier and later. A theme underlying this collection is selective acquisition to form a "time series" illustrating the development of a particular item like the HRO receiver. The owner credits Michael Tannenbaum and other AWA members with supplying information on American-originated items.



Right: replica of the De Forest RJ-4 audion detector. The spherical audion, socket, and rheostat are original. The case came from Roland Matson, at one time a source of excellent repro parts. The brass items were machined by the collector.



Left: two versions of the HRO - an HRO Senior, 1939, and an HRO-5A1, 1946; with matching power units and speakers.



Right: an HRO-7, ca. 1948, and an HRO-50-1, ca. 1952, the final single-conversion descendant of the receiver developed through the genius of National's design engineer James Millen.

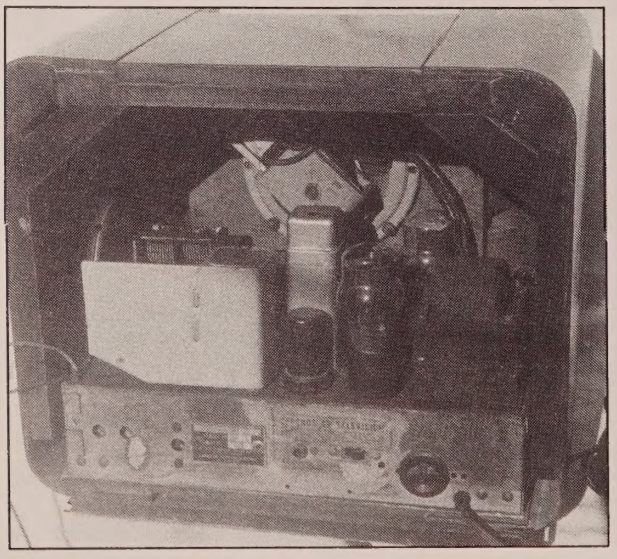
A RESTORED GEM FROM CANADA - CGE's JK53

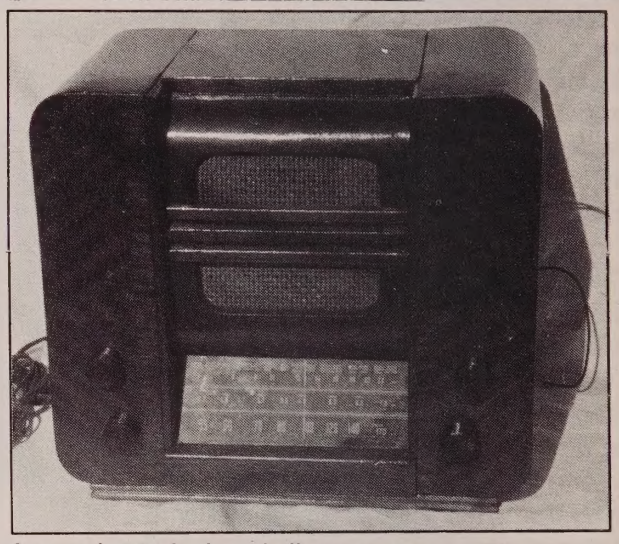
Bob Haworth, W2PUA
112 Tilford Rd., Somerdale, NJ 08083

Our brothers and sisters North of the Border have always produced products that closely parallel ours - be they autos, buildings, or that home appliance closest to our hearts, the radio.

The Canadian General Electric Co., Ltd., was a mainstay of radio development and production during the 1930s, when the model JK53 came into being. During this period Canadian sets differed from American construction primarily in the materials and design of the casework. The electrical design, tube lineup, etc., paralleled closely those of U. S. makes. One notable exception in the electrical design centered on the capability, and size, of power transformers. By the 1930s the power grid of the U. S. was fed almost exclusively with 60-Hz power, while in Canada two systems existed. Both 25 and 60 Hz were in use, with 25-Hz power centered mainly around the Niagara Falls area. This meant that power transformers had to be larger, with more iron, and many sets were made with this dual capability. Since the JK53 came into existence in the late '30s, its design was for 60-Hz use only. Perhaps the export market helped shape this decision.

It is unknown how many homes have enjoyed this particular JK53 over the years or what its path was to the local flea market where I procured it. It had suffered through the years, losing all the veneer on the top. Other veneer had become loose and "floating" as it separated from the base wood. The major portions of the set were complete, however, with the chassis, tubes, knobs, etc., all present and accounted for. The set was grimy, being covered with a thick layer of black sooty dirt that gave the impression that it had been stored in a coalyard for the last few years of its life. For the grand sum of eight dollars, I decided to see what I could do with it. The pictures show the result of a little applied electronics and a lot of elbow grease.





The JK53 probably represents the height of small-cabinet design, since beautifully grained "ribbon" style mahogany veneer is used in a cross-graining pattern to enhance the beauty of the radio's front and top. Woven cane, like a caned chair seat, is used as for the speaker grille. The many curved surfaces on the cabinet create a view pleasing to the eye in the radio's 12" x 14" x 9" size.

Electrically, the set uses the six-volt version of the "All American Five": 6SA7 converter, 6SK7 IF, 6SQ7 detector/audio, 6F6G output, 5Y4G rectifier. Like American sets of the late '30s, the JK53 has capability for television. Yes, a flick of the switch on the rear apron and you could use the audio section for either playing records from an external phono or piping-in sound from your "new" TV tuner, like an RCA TT-5. The sales gimmicks of those years equalled what's done today.

This set features a wide frequency range, with expanded broadcast-band capability: 540 to 1750 kHz. About the time it was made, 540 kHz was added to the bottom of the broadcast band - as a *Canadian* clear channel. The two shortwave bands cover 2.3 to 7 MHz and 7 to 22 MHz, ready for CBC national internal programming on SW.

Predating the era of small internal loops, the set has separate antenna and ground connections - a wise accommodation to listening in the wide-open spaces of the western provinces. A short (7') antenna has provided excellent reception on all bands and a two-foot piece of wire provides good copy of local AM stations.

The sensitivity and sound quality of the set are excellent, while the beauty of the cabinet is timeless. I salute our friends "north of the border" for bringing this radio gem into existence. They did a super job.

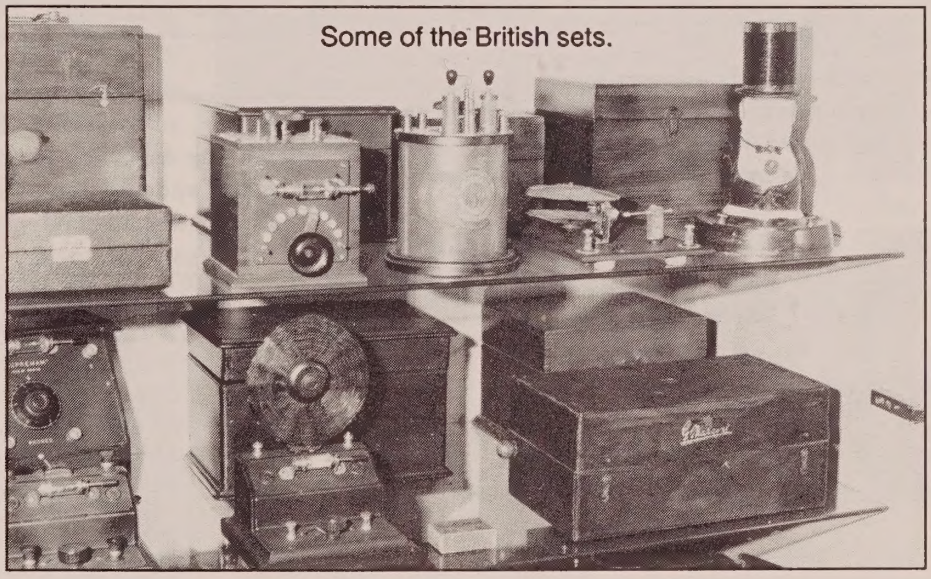
COLLECTING CRYSTAL SETS IN AUSTRIA

Erwin Macho
Ambrosweg 17/A/8, A-1230, Vienna, Austria

The Radio Age started in Austria in 1923, with the first activities of the broadcast station "Radio-Hekaphone." The transmitter worked with a power of 100 watts on 600 kHz. Many of the first listeners used crystal sets, most of which were home-made.

Fascinated by the principle of crystal sets, "listening without energy," powered only from the broadcast station, in 1979 I bought my first crystal receiver. It was a home-made set from the first period. This was the beginning of an intensive search. Some years later I owned most of the popular Austrian crystal sets and began to look to Germany. I became a member of the "GFGF" (Gesellschaft der Freunde der Geschichte des Funkwesens), the German society of radio collectors. This was the time where I began receiving crystal sets from other parts of the world. My first set from American, a Philmore in very poor condition, came in. Crystal sets followed from England (in 1985 I became a member of the British Vintage Wireless Society), Poland, Sweden, and many other countries. In 1987 I took out membership in the

Crystal detectors and containers - "Rex," "Rotor," "WISI," "Omega," "Jdealit B," "Siemens & Halske," "Heywood's," "Vulcan, "Ivalek," etc.



Some of the British sets.

The author and a group of American crystal kits.

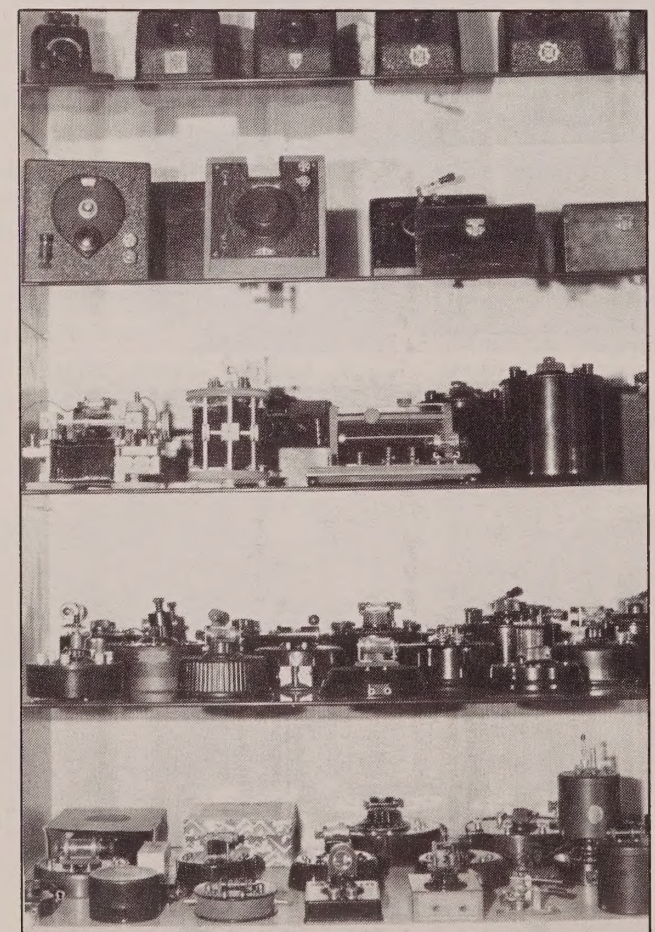
Antique Wireless Association. This was the beginning of my transatlantic contacts. Many collectors in the USA sent crystal sets (thanks to all!).

Meanwhile, I have 270 crystal sets from all over the world. Most of them are prewar, but I also like sets from the late '50s with modern diodes. Special parts of my collection are crystal kits from the USA and the well known Philmore sets, of which I have a dozen versions.

For the future I hope to get some of the missing sets which would complete the collection - a Federal Junior set or other novelty.

Collectors who wish to correspond or would like to visit my collection during their holidays are always welcome. They are invited to write to the address above.

The American section, with some novelties like the Martian Big 4 (upper left, on tripod) or the Monarch (round set in top center); also a pair of Carron receivers (top right), several Philmores (one shelf down, on left); a Miller hi-fi AM tuner and Heathkit receiver (bottom right).



The Austrian section, which totals 57 sets.

BACK ISSUES

The following issues of the *OTB* are in stock and orderable via AWA, 44 E. Main St., Flemington, NJ 08822-1224. Prices are $2.50 each postpaid. Comprehensive index to *OTB* Vols. 16-32 and Review Vols. 1-6, free on request with purchase.

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33-2	33-3	33-4	34-1	34-2	34-3	

The following special-theme issues contain the normal columns and news, but also a core of features on a particular topic area. The number of special-focus pages in each issue is listed below.

40th Anniversary Special ("Best of OTB, 1960-82") (33-2, June 1992) - all 48 pp.
Broadcast Receivers (30-4, Feb. 1990) - 12 pp. of 48.
Communication Gear (32-1, May 1991) - 18 pp. of 48.
International topics and equipment (31-4, Feb. 1991) - 11 pp. of 48.
Military equipment (30-3, Nov. 1989) - 17 pp. of 48.
Restoration I (31-2, Aug. 1990) - 20 pp. of 56.
Restoration II (34-2, May 1993) - 17 pp. of 68.
Tubes (31-3, Oct. 1990) - 19 pp. of 48.
Wireless equipment and stations (31-1, May 1990) - 15 pp. of 48.

RADIO COLLECTING IN ISRAEL

Dick Mackiewicz
1549 N. River Rd., Coventry, CT 06238

Readers of antique-radio publications have recently seen articles about collecting in Hawaii, Australia, and South America. The collecting of old radios and memorabilia is becoming universal. Here is a recent report from Israel.

A display of antique radios and associated articles was recently organized in Israel by two local collectors, Junger Bencze Ferenc and Bruno Pinto. It was held at Gyvat-Aym, a nice section of Tel-Aviv, in an ultra-modern building belonging to the city management. The conference room containing the display is about 60' x 90'! The exposition was open from December 20th until January 14th, 8 AM to 10 PM, except for Friday afternoons and Saturday evenings. Attendance seemed especially heavy before lunchtime. It is estimated that several thousand people passed through the doors before the close.

The event was publicized in Israeli newspapers and on the local cable-TV network. Many of the American sets shown had been brought to Israel by Bruno Pinto. Junger Bencze Ferenc provided the Zenith display.

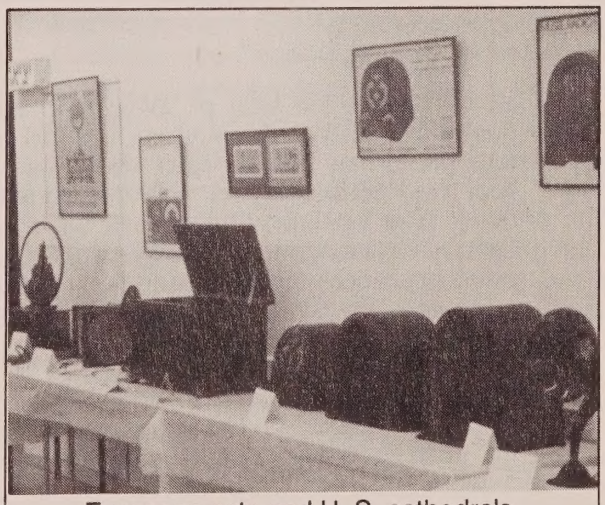
A British set owned by Junger, the round Ekco A22T, was the "hit of the show." Another very interesting item was the homebrew Quaker Oats crystal set - the carton was printed in Hebrew!

As Israel had no early radio manufacturing industry, settlers brought radios from their former countries. Many of the visitors at the show recognized European radios from their past.

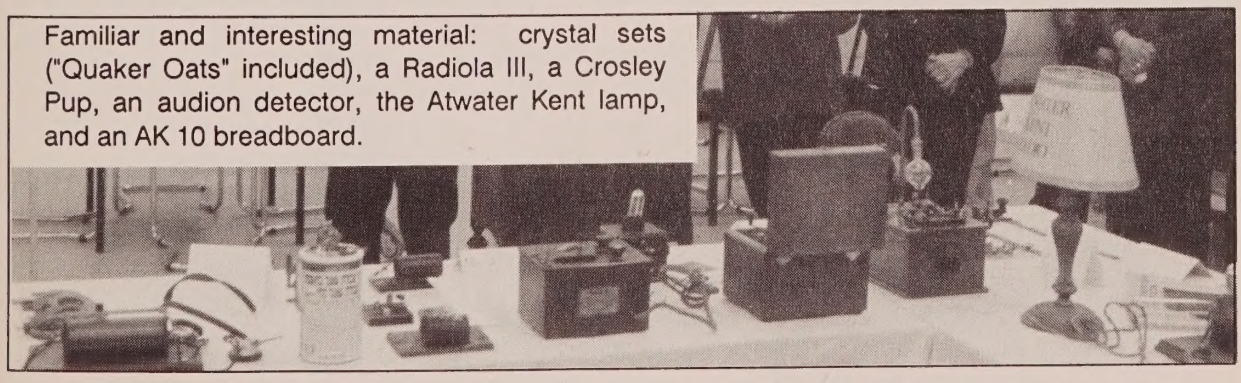
Junger reports that some old tube-type radios still end up in Israeli trash barrels, whereas others - often formerly cheap sets - will have an asking price in the hundreds of dollars. If this sounds familiar, it only adds to the fact that radio collecting is essentially the same, no matter how many miles separate fellow collectors!

Show organizers Pinto and Ferenc relax for a moment.

The Pilot set, center, is playing '20s music.



European sets and U. S. cathedrals.



Familiar and interesting material: crystal sets ("Quaker Oats" included), a Radiola III, a Crosley Pup, an audion detector, the Atwater Kent lamp, and an AK 10 breadboard.

(Continued from p. 10)

cathode-ray systems - important advantages like brighter, sharper, larger pictures. They also offered longer life, lower maintenance cost and better reliability.

There was no popular resistance to mechanical systems, as there might be today, and receivers were being sold. As a result, there was an ongoing effort on the part of many companies to improve existing equipment and to develop new ideas.

World War II completely ended the activity in mechanical television but generated an intense interest in cathode-ray tubes and their associated circuits. The reason? . . . *RADAR*! By the end of the war, there had been so much progress in radar development, much of it transferrable directly to television, that the first postwar commercial receivers included 15" and 20" direct-view models, as well as projection sets providing newspaper-sized images.

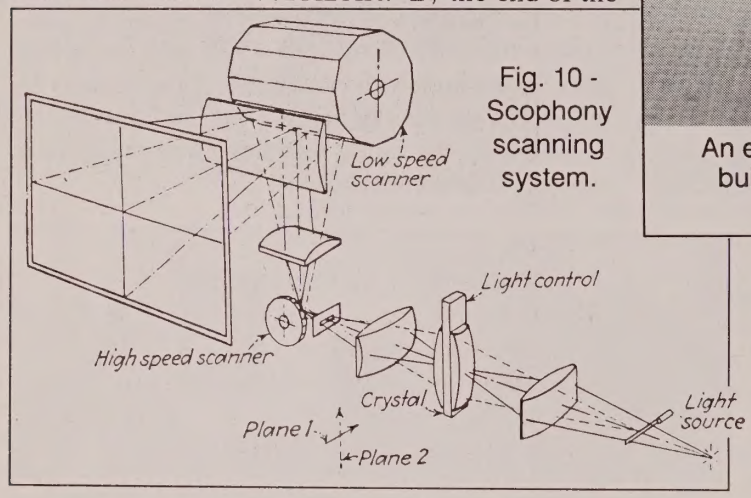
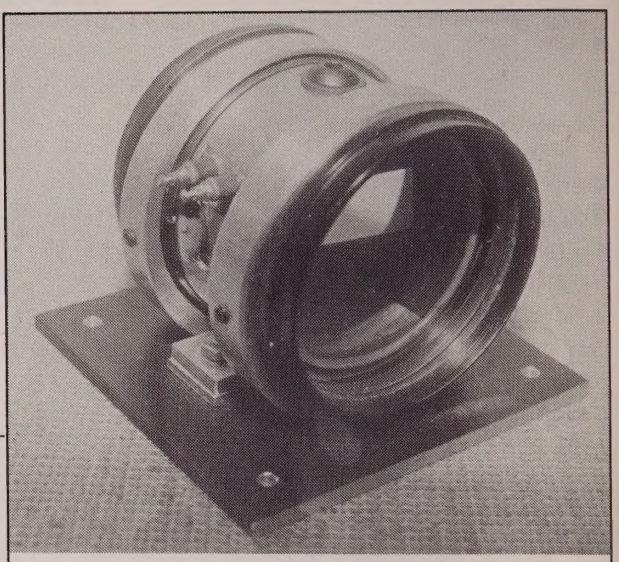
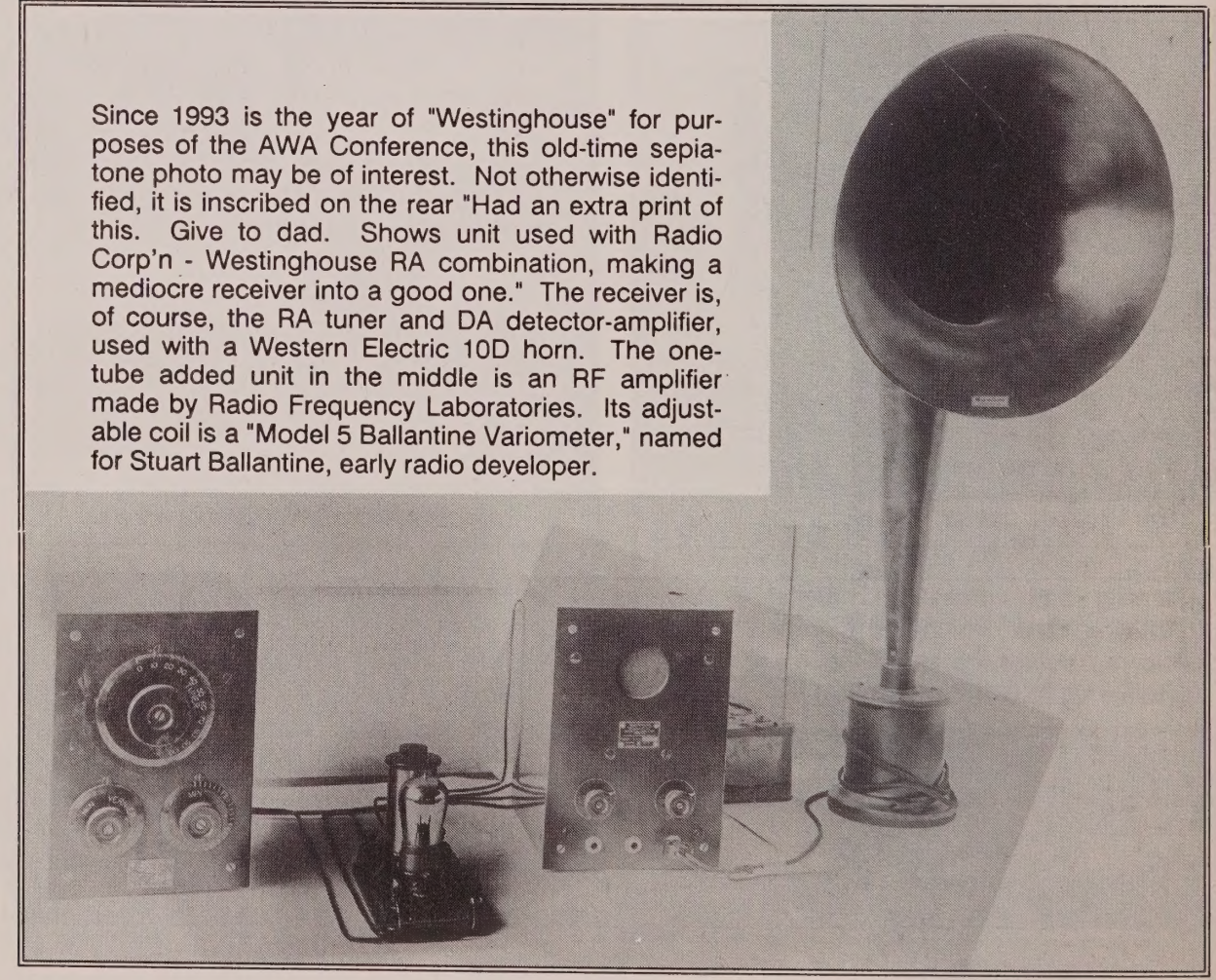


Fig. 10 - Scophony scanning system.



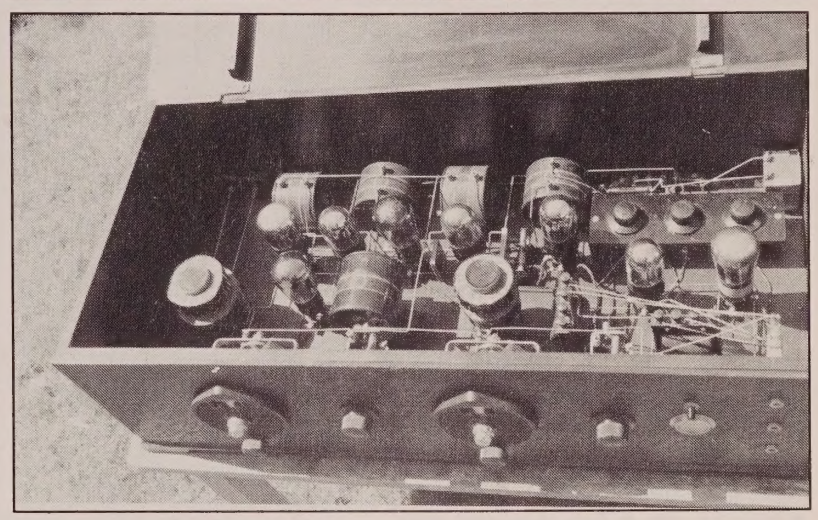
An example of a Jeffree cell with lenses, built by the author, 2-1/4" dia., 2-1/4" long, 10-MHz crystal.



Since 1993 is the year of "Westinghouse" for purposes of the AWA Conference, this old-time sepia-tone photo may be of interest. Not otherwise identified, it is inscribed on the rear "Had an extra print of this. Give to dad. Shows unit used with Radio Corp'n - Westinghouse RA combination, making a mediocre receiver into a good one." The receiver is, of course, the RA tuner and DA detector-amplifier, used with a Western Electric 10D horn. The one-tube added unit in the middle is an RF amplifier made by Radio Frequency Laboratories. Its adjustable coil is a "Model 5 Ballantine Variometer," named for Stuart Ballantine, early radio developer.

A *RUNDRADIOMOTTAGNINGSAPPARAT*

Pat Leggatt
Garretts Farm, Pankridge St, Crondall, Farnham, Surrey GU10 5QU, England



Finland has given us Sibelius and no doubt many other good things - although they can't lay claim to Huckleberry - but somehow I hadn't expected to acquire a vintage radio from that country. Nevertheless, there it sits in my collection, a fine eight-tube superhet from Turku, which was the Finnish capital city before Helsinki took over in 1812.

Although assembled about 1926 in Finland, the design is clearly Swedish, with circuitry very similar to that of a kit set produced in 1925 by the Särnmark company of Göteborg. In with the set was the Finnish owner's 1931 Broadcast Receiver License, costing 100 Finmark, giving authority to possess and use a *Rundradiomottagningsapparat*!

From the outside, the set looks rather grim, an uncompromisingly rectangular box in dark oak like a coffin. But open the lid and it comes to life. Tubes all twinkling in a row; coils with bright green insulation, orange wrapping and scarlet labels; and the whole thing hooked up with still-shiny wire dressed with proper right-angle bends.

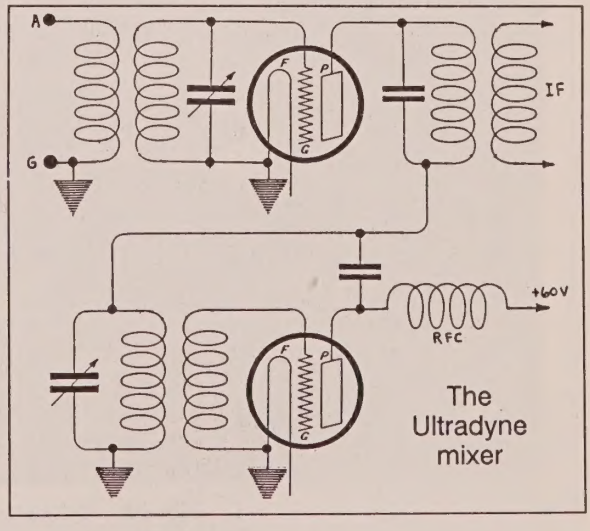
All the tubes are triodes and the circuitry is generally straightforward. A mixer with separate oscillator feeds three 90-kHz IF stages with fairly flat-tuned transformers. Variable bias to the IF stages is provided by a volume-control potentiometer across the "A" supply. A leaky-grid second detector passes audio on to two transformer-coupled AF stages. Jack sockets provide for headphone operation from the detector or from the first AF stage, if final loudspeaker output is not wanted. Inserting a plug cuts the audio feed to the following stages; but surprisingly it does not disconnect the filament supply to these, although this was a common practice in the 1920s for economy in battery drain and tube life.

Tubes are four-volt types* fed from a 6-volt "A" battery. Three preset filament rheostats offer adjustment respectively of the group of six tubes up to and including the detector; and, individually, the first and second audio stages. A master panel-mounted rheostat controls all filaments, with an "off" position. A small meter on the panel is switched to indicate "A" or "B" supply voltages.

The panel-mounted filament and volume controls are of interesting construction. The resistance element is wound on a flat strip pressed against a helical cam, of which the point in contact at any moment "screws" along the resistance strip as the cam is rotated by the control knob.

The most unusual feature of the set, to me at any rate, is the use of the Ultradyne frequency-changing configuration; I have never come across any other example of this. On tracing out the circuit, I found the mixer anode going to ground through the IF transformer primary and the local-oscillator coil, with no B+ feed; and I thought "Silly old fool, you've got it wrong again!" But no, the accompanying diagram of the mixer and oscillator is indeed correct and the only potential on the mixer anode is the oscillator waveform. This means that the mixer tube will conduct and amplify the incoming RF waveform only during the positive half-cycles of the oscillator excursions, which of course im-

(Continued on p. 30)



The Ultradyne mixer

* North American readers may be intrigued to know that, unlike 01As with their 5-V 0.25-A filaments, early battery tubes in England and Europe (USSR included) predominantly used four volts. - Ed.

THE CANADIAN MARCONI "C" SET

Roger Hart, VE2HBR
4533 Harvard Avenue, Montreal, Quebec H4A 2X3, Canada

One of the first tube radios to be built in Canada for the domestic market was a single-tube regenerative receiver, the "C" set, from The Marconi Wireless Telegraph Company of Canada Limited (MWTC), now Canadian Marconi Company. Introduced in 1922, the set was based on individual components made initially for commercial use and moved into the domestic marketplace when broadcasting started to grow. The basic set consisted of an S.T.1 Tuner and a V.D.1 Detector. A two-stage audio-frequency amplifier, the A.A.1, was also available, as was an oak battery box. Prices ranged from $60 to $155 (Canadian), depending on the accessories chosen. Figure 1 shows the three units with battery box and loop antenna.

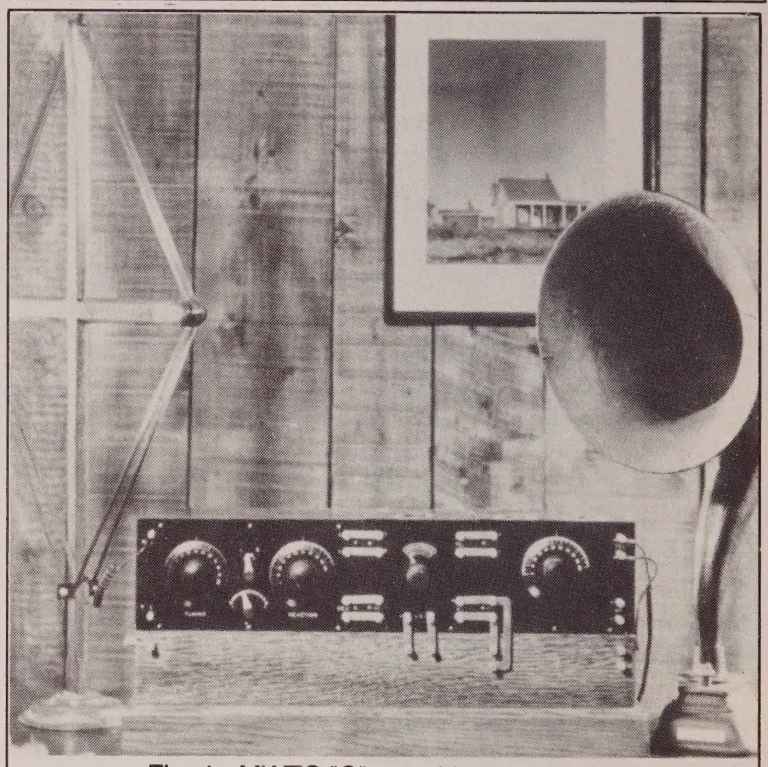


Fig. 1 - MWTC "C" set with battery box.

The "S.E." Tuner, Type S.T.1 (Figure 2) was housed in a oak box approximately 9-3/4" W x 4-3/4" H x 6" D. It covered both the "short wave" band, 180 to 400 meters (750-1666 kHz), and the "long wave" band, 400 to 600 meters (500-750 kHz). (The instruction book was careful to point out that these figures referred to the tuning range, not the receiving range, which, the reader was assured, was "from 100 to 500 miles or more"! An alternative version of the S.T.1 was apparently made for commercial use (see Figure 3), with a three-section wave-wound coil and a brass knife switch in place of the tapped coil, variometer and stud selector, and probably predates the domestic version. The significance of "S.E." is not known, but may have stood for "Scientific Experimenter," a retail company run by MWTC from 1919 to 1924 to sell wireless and other scientific equipment to the public. The set was, however, also sold through a number of retail outlets across Canada.

The "S.E." Detector, Type V.D.1, Figure 4, was

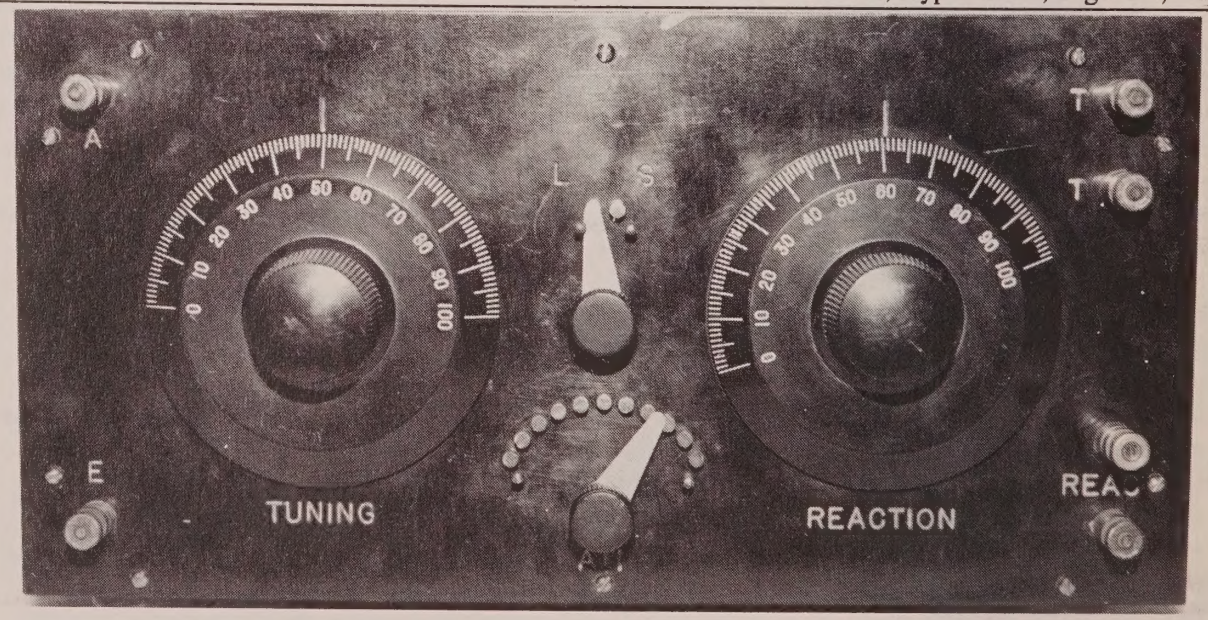


Fig. 2A - "C" set, S.T.1 tuner, front view.

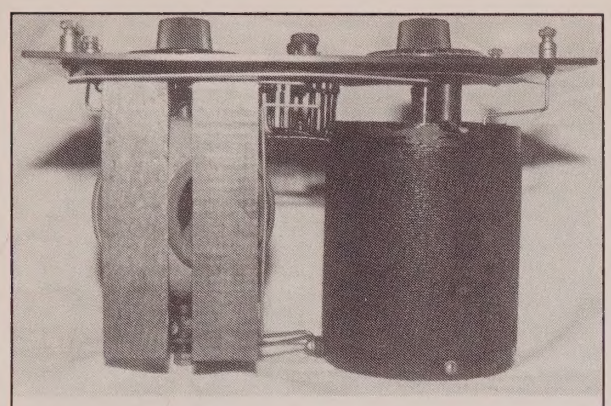


Fig. 2B - "C" set, S.T.1 tuner, top view.

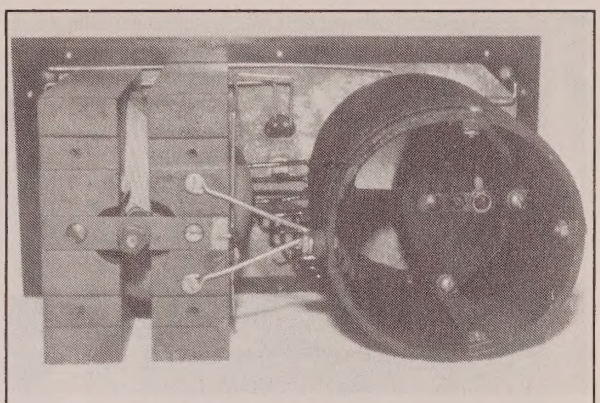


Fig. 2C - "C" set, S.T.1 tuner, rear view.

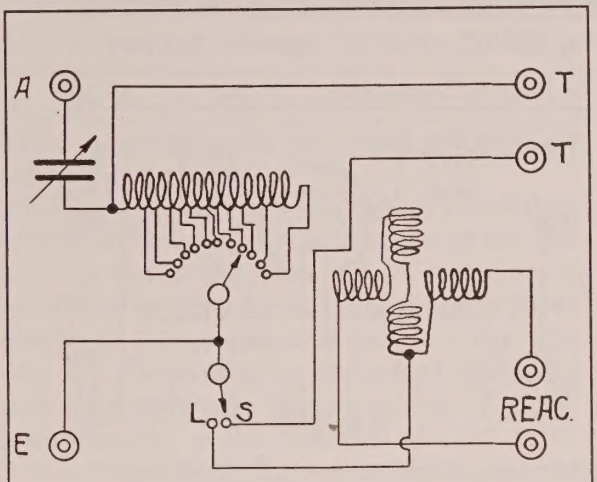
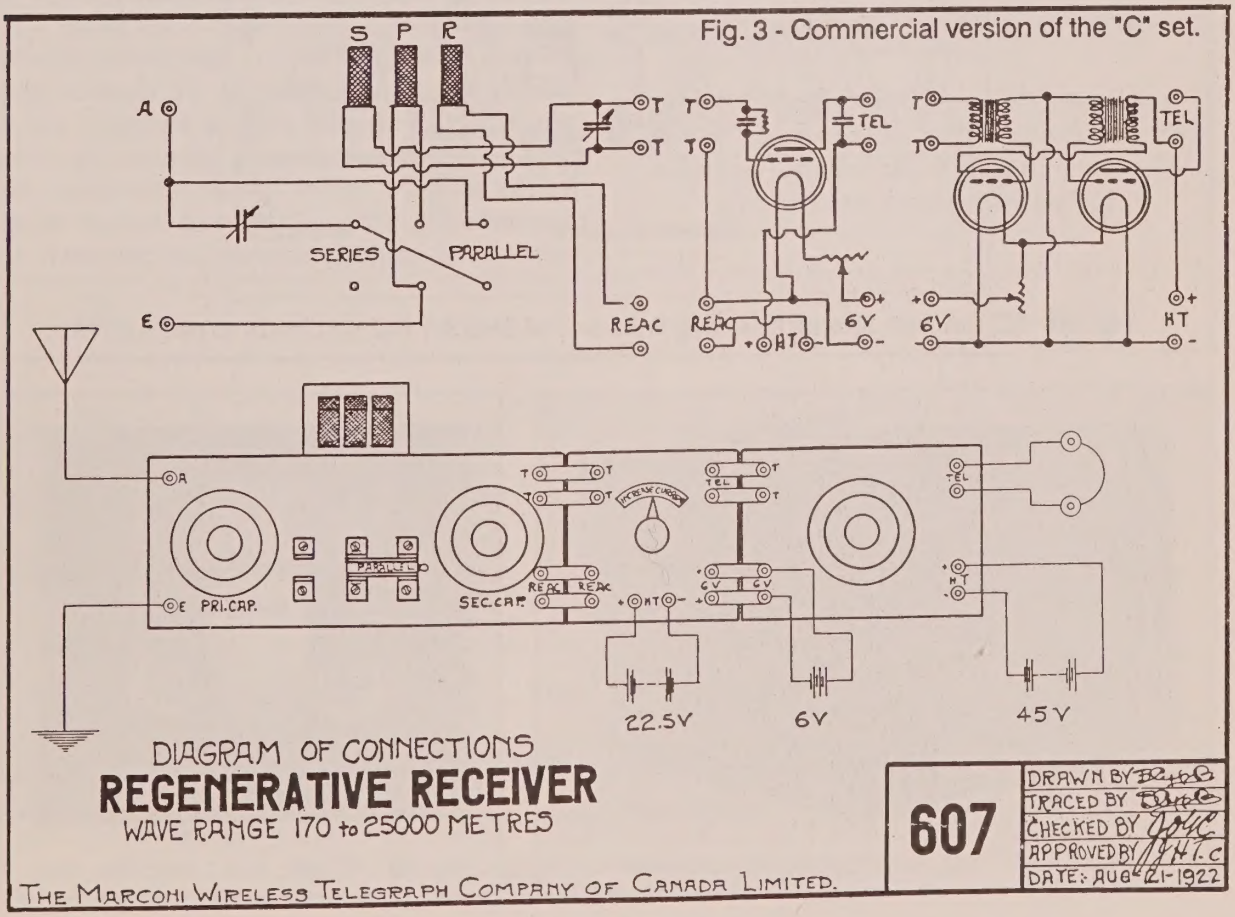


Fig. 2D - "C" set, S.T.1 tuner, schematic.

the same height and depth as the S.T. 1, but only 6-3/4" wide. It used a single '200, and is interesting in that the metal tag on the lid was inscribed "Pat'd 1906-12," perhaps indicating that it was a descendant of an earlier audion-type device. Several minor variants are known, including the substitution of a graduated skirted knob for the metal pointer type on the filament control (MWTC drawings and advertisements show both versions). In June 1923, a drawing was issued showing the crossconnections for using a 201A tube in place of the original 200 (Figure 5).

The "S.E." Amplifier, Type A.A.1 (Figure 6) was also 4-3/4" high and 6" deep, but 6-3/4" wide. It was a basic amplifier, using two 201As, with audio transformers wound on bundled cores of iron rod housed in wooden boxes within the oak case. As

Fig. 3 - Commercial version of the "C" set.



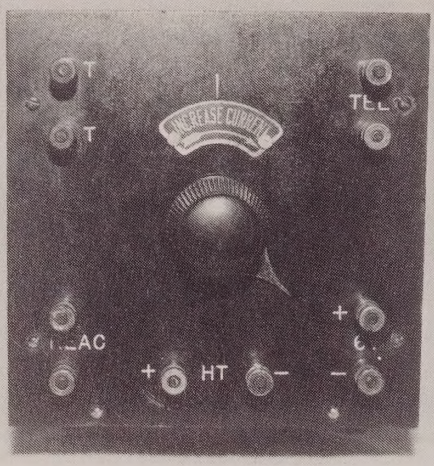


Fig. 4A - "C" set, V.D.1 detector, front.

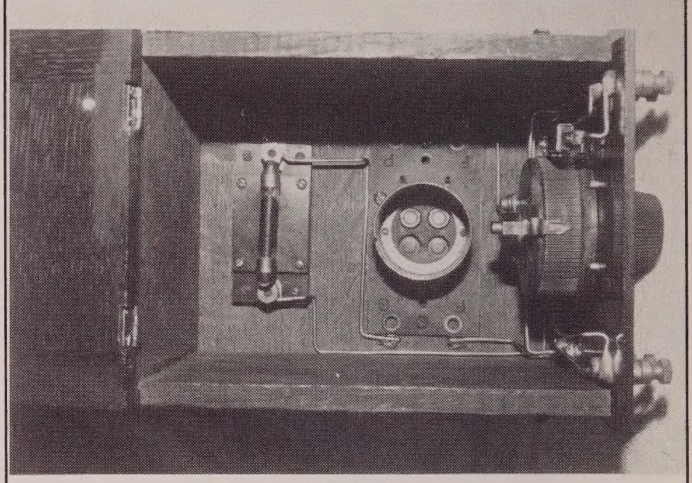
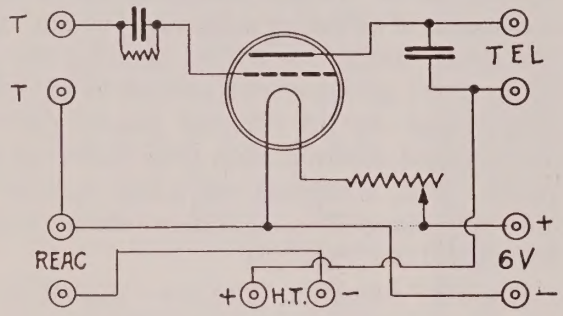


Fig. 4B - "C" set, V.D.1 detector, top view.



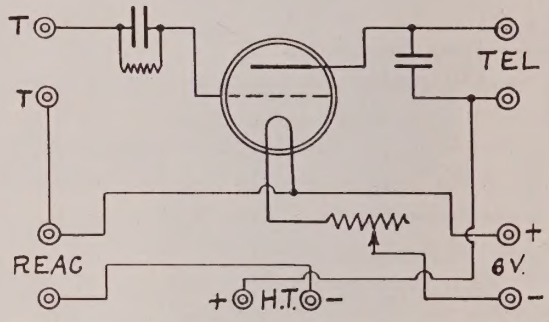


Fig. 5A - "C" set, V.D.1 detector, original (left) and as revised for use with 201A tube.

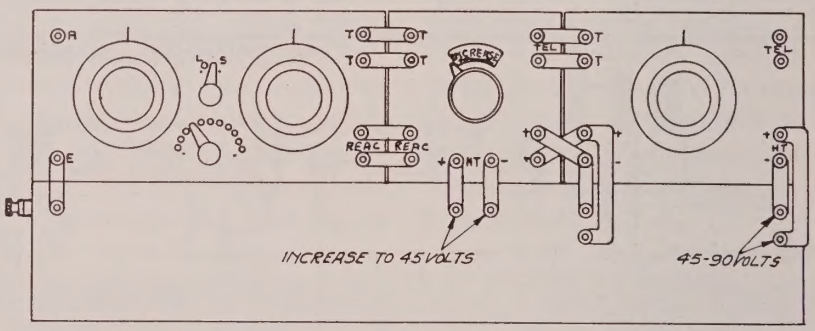


Fig. 5B - "C" set, with special reversing links on the detector filament leads to use a 201A.

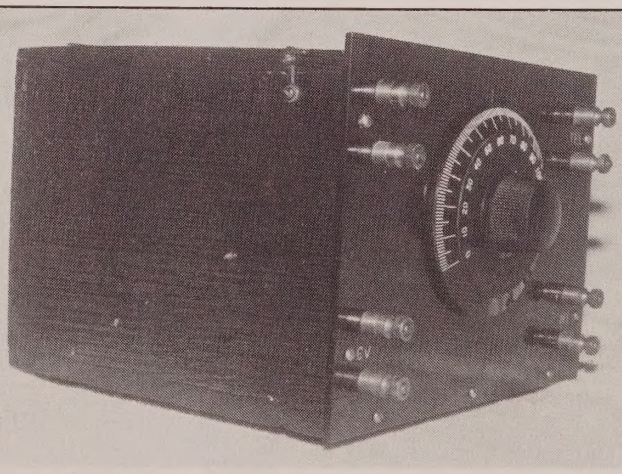


Fig. 6A - "C" set, A.A.1 amplifier, front view.

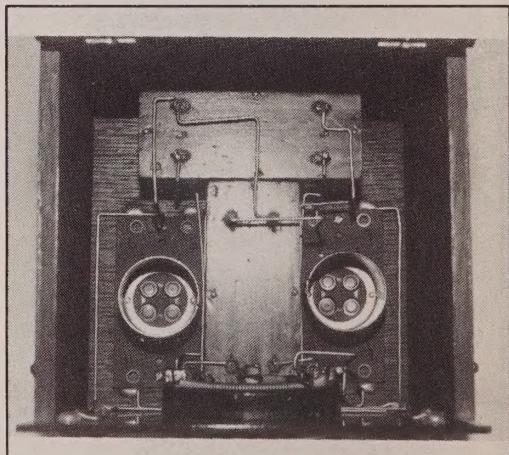


Fig. 6B - "C" set, A.A.1 amplifier, top.

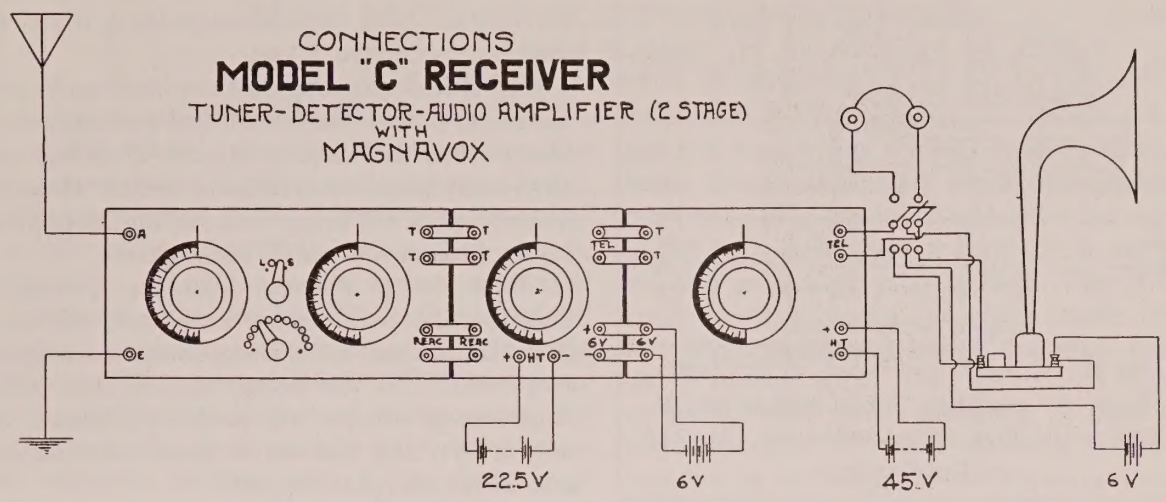


Fig. 6C - "C" set, complete assembly with S.T.1 tuner, V.D.1 detector, and A.A.1 amplifier.

with the other units, the front panel was made of an ebonite-like material.

MWTC also built at least one P.A.1 ("Power Amplifier"?), shown in Figure 7, housed in an oak box similar to that of the other "C" set components. The MWTC drawing for this 1-tube unit is dated February 5, 1923, but no reference to it has been found in any advertising or instruction leaflets, and it may never have gone into production. The only known example, in the collection of Herb Fredrickson of Saskatoon, was probably an engineering prototype, superseded by the 2-tube A.A.1 before it ever got onto the market.

A drawing dated January 11, 1922 (Figure 8) details a "Long Wave Attachment" to cover the 2000 to 18,000 meter range (17-150 kHz), and a drawing for an untuned RF Amplifier for use with the "C" set was approved in 1924 (Figure 9). From the wavelength coverage, it seems that these may have been components aimed at the amateur experimenter market through Scientific Experimenter Ltd. However, no example of either is known to

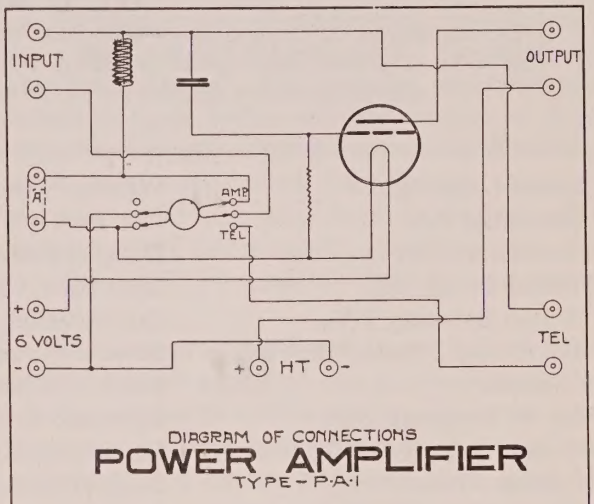


Fig. 7 - "C" set, P.A.1 power amplifier. The link "A" was to be removed when sharing the A-battery with the rest of the set, and installed when using a separate battery.

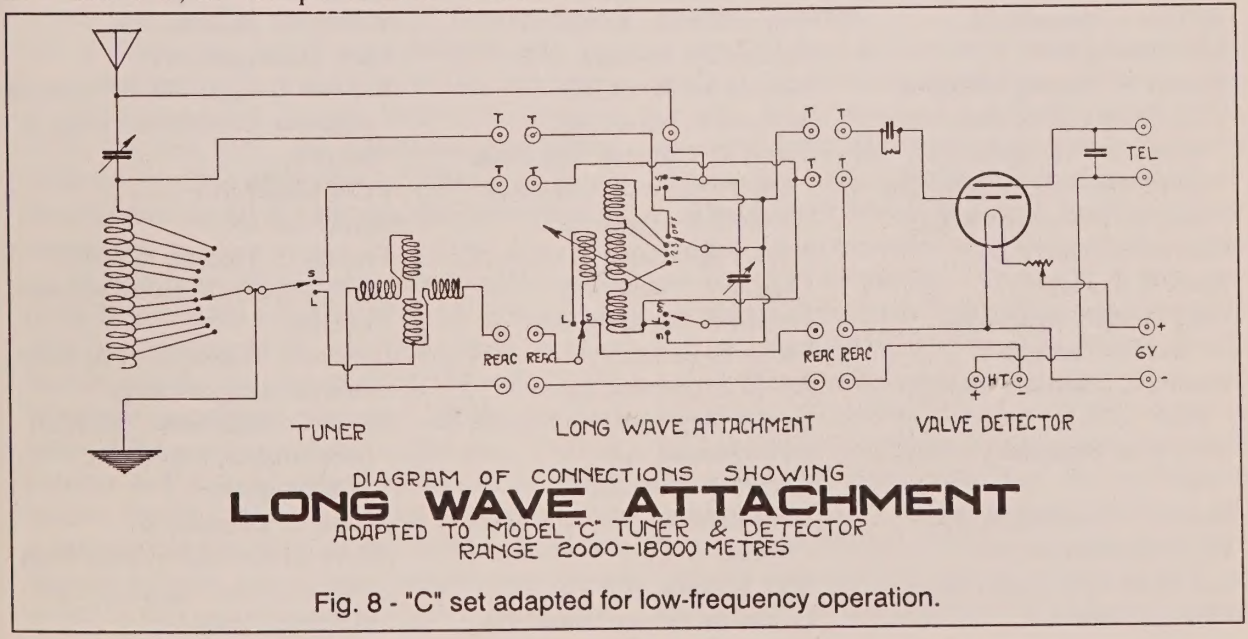


Fig. 8 - "C" set adapted for low-frequency operation.

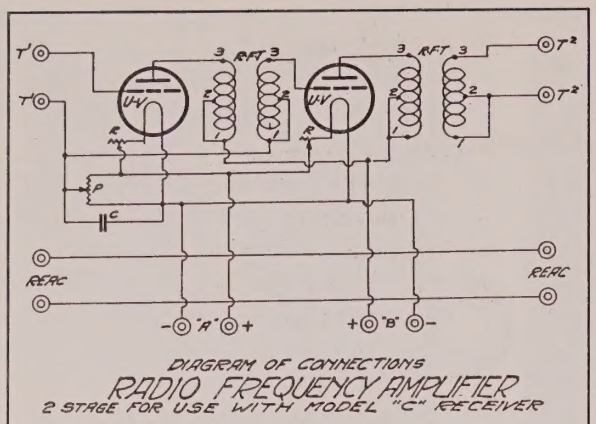


Fig. 9 - RF amplifier. Tubes were to be UV-199s or UV-201s; RF transformers, UV-1714 or Dubilier-type.

exist, and they may never have gone into production. In any case, the Marconiphone I, II and III soon superseded the "C" set.

Very little documentation about early radio production in Canada has been found and, as is often the case, this brief enquiry into the "C" set has raised as many questions as it has answered. Hopefully, however, it will bring forth further information from collectors who can fill in the details.

Roger Hart is Manager, Marketing Services, at Canadian Marconi Company in Montreal and has a "small but tasteful" collection of domestic sets of the early 1920s. He has been collecting since 1987. Roger would welcome any further information on early MWTC sets, and can be contacted at the address above, tel. (514) 483-3857.

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AWA welcomes the following collector-historians. We list all new members routinely - if your name does not appear within six months, please advise the Editor. If you do not wish to be shown, just mark the application form accordingly. AWA does not provide an address list or other directory of its membership.

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Jim **Amici**, PA
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Walter **Bernd**, NY
Robert **Betensky**, NY
Dr. Robert I. **Botto**, TX, Vintage Sounds
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Donald **Buja**, WA1FHR, NH
Cardon, France
Edward **Cartotto**, W6ZZN, CA
Jimmy Ka Keung **Chan**, CA
Stephen **Cleveland**, WA
Carl W. **Closs**, WY
James **Cole**, W2TM, NC, comm equipment engineering & mfg.
William J. **Danzelli**, IL
J. R. **Downs**, SC
Robert W. **Downs**, WA5CAB, TX, USN-USNR electronics technician and underwater ordnance specialist; Vetco Pipeline Services engineering
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Gary **Fender**, W6SFX, MI
Carol W. **Fertig**, NY
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Sidney N. **Greenspan**, MO
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Peter **Pagnattaro**, K2MDN, NY
Glenn L. **Parker** MI
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David L. **Quinlan**, NJ
Earl A. **Reynolds**, Jr., N2FBQ, NJ
Al **Richmond**, AZ
Daniel **Racovaz**, ON
Jerry **Roberts**, NY, JPR Electronics
Nick **Sassano**, NY
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David A. **Smith**, Jr., N2KSZ, NY, Merriam Instruments Inc., New England Wireless & Steam Museum
David **Sowers**, NV
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Bernard A. **Stratmoen**, IL, engineer with Ohmite
John P. **Streb**, NY
Robert J. **Stutzman**, TX
Patrick **Sussick**, NJ
Henry **Tate**, N4RNN, GA
Robert G. **Thomas**, PA
Glen **Thompson**, WI
F. Scott **Tonges**, CO, RF systems engineer, Goldstone Tracking Station
Peter **Ulmer**, NY
Mark **Vail**, IN
Francis H. **Vincent**, KC4SRT, GA, 48 years in electronic service biz
Linford S. **Walter**, Jr., PA, Navy aircraft electronics opr
James C. **Wharteny**, NJ, RCA Laboratories, Microwave Semiconductor
Arthur C. **Zwemke**, IL
(More names next quarter from May and later - space is short this time - Ed.)

RADIO RECEIVER NOISE - REMINISCENCES

Edward W. Herold
332 Riverside Dr. E., Princeton, NJ 08540-5414

In 1930, when I joined the RCA Radiotron Co. as a development engineer on receiving tubes [1], radio frequencies above 30 MHz were little used and tube noise did not limit the reception of weak signals [2]. By 1938, however, when I transferred to research, television and FM had reached the stage of practicality and opened up the VHF range (30-300 MHz). Even UHF (300-3000 MHz) was being explored for microwave relays, radar, and other uses. Receiver and tube noise now became an important limiting factor in the reception of weak signals. Furthermore, high power for transmitters was difficult and expensive so that every improvement in receiver signal-to-noise ratio reduced the needed transmitter power. It was a research challenge and I joined the effort to help.

Among my new colleagues in research was D. O. (Don) North, who had done much of the work in a classic series of five papers on tube noise [3]. Don was now working on fundamental problems in reception, of which more later. Another colleague, G. Ross Kilgore, was exploring a new and different control method for UHF amplification, using deflected electron beams. I joined him to try this new control method for a UHF superheterodyne mixer, using a new principle of frequency conversion that I had invented [4]. (Neither Ross nor I published on this work until after World War II.)

I had already completed a study of noise in frequency converter systems for television [5], but had never done a complete analysis of overall signal-to-noise ratio (S/N) of a receiver for UHF. I remember my excitement after a crude initial calculation of S/N for a hypothetical receiver in which the variable was the transformer ratio between the antenna and the input electron tube. Up to that point, it was often believed that, because the maximum signal transfer occurred with matched impedance, this was likely to be the condition for best S/N. My calculation gave a very different result: there was a definite optimum transfer ratio and it did not coincide with matched impedance.

At this time, Don North was completing his more fundamental concepts of radio reception in which he postulated an ideal noise-free receiver and derived the limiting sensitivity (he called it the "absolute sensitivity") imposed by the thermal noise of the antenna radiation resistance. That an antenna had thermal noise like that of an ohmic resistor should have been obvious but, believe me, it came as news to many of us. North pointed out that an antenna had a noise temperature determined by that part of space to which it could transmit and from which it could receive. Thus, antenna noise temperature could differ markedly from room temperature. I remember the reaction of our RCA colleagues on Long Island who were working on a UHF relay system. They pointed their directional antenna at a huge bonfire, which they purposely lighted, to see if they could detect a rise in receiver noise. They did report a slight increase but the receiver noise was so great as to leave the effect somewhat uncertain. (This was long before the advent of the Dicke radiometer, which made measurements easier.)

North's most significant proposal was that any non-ideal receiver could be evaluated by the ratio of the noise power it produced to that it would have had from the antenna alone. He called this the "noise factor." He expected measurements would be made with a dummy antenna at room temperature and added the correction if the antenna noise temperature was different. An ideal receiver would have unity noise factor (zero dB). If the receiver had a matching resistive input, but no other source of noise, the noise factor would be two (3 dB).

All the above contributed to my S/N analysis, which was now expanded into a complete one, including bandwidth considerations. The latter were important because, obviously, a receiver that was optimum for a narrow frequency band might be useless for a system (such as TV) that required substantial bandwidth. The results also showed that the optimum S/N could easily be several dB better than with a matched impedance. Also, if one were ever to get below the 3 dB noise factor of a room-temperature matched impedance, a mismatch is essential.

My S/N formulations were inclusive enough to apply to the aforementioned beam-deflection mixer tube. When this work was finally published [6], we showed that the calculated noise factor came within a few tenths of a dB of the measured value.

The start of World War II in Europe and the need to improve radar and military electronics persuaded us to publish. North and I then prepared a pair of papers [7, 8] which were printed in the January 1942 issue of the *RCA Review*, shortly before the suspension of that journal during the war years. We also gave oral presentations to the IRE National Convention at about the same time. After the U. S. entered the war, the results were incorporated into a lecture series given by a colleague, Louis Malter, and me; later published [9].

North learned indirectly that Harald T. Friis, at Bell Telephone Laboratories (BTL) had arrived at

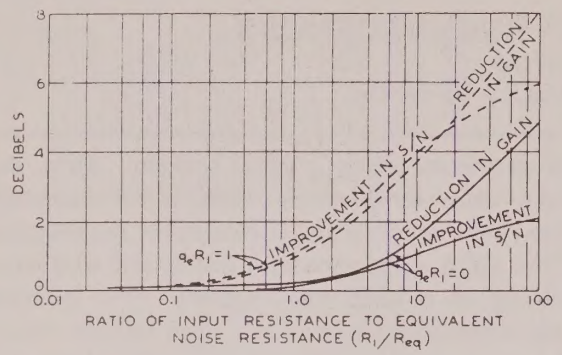

Figure 6 from reference 8 compares coupling for best signal-to-noise ratio, S/N, with coupling for best gain (matched impedance). The solid curves are for purely ohmic loading and the dotted ones for purely electronic loading. Practical conditions lie in between.

a concept similar to noise factor which Friis called "noise figure." According to what we were told, the Friis equivalent of an ideal receiver was one with an impedance-matching input. Thus, by North's (and my) standards, the Friis ideal receiver would be 3 dB poorer than it need be, and the Friis noise figure differed from North's by a factor of two.

It wasn't easy to persuade the BTL group that one could achieve a useful S/N that was better than the Friis ideal. They seemed committed to the impedance-matched concept, even though analysis showed the advantage of optimization. I recall some long arguments I had with a BTL engineer, Fred B. Llewellyn, who had, himself, published extensively on receiver design and tube noise. However, by the time Friis published his work in 1944 [10], he and others at BTL were persuaded and the North-Friis difference disappeared in favor of North.

There was one surprising and perhaps unfair development. Even though North had published first and had the correct result from the start, in the U. S. the term "noise factor" did not dominate usage. The Friis term "noise figure" was given at least equal and sometime exclusive usage. It is possible that this came about because the Bell System research and engineering staff vastly outnumbered those at RCA and knew the Friis work much better than that of North. Of interest here is an exchange of comments between North and Friis [11].

The real hero of this story is Don North. Almost everything I knew about noise I had learned from him, and that was what made my work possible. As the years passed, North's contribution far eclipsed mine. Today, noise factor/figure remains the most useful way to evaluate receivers, such as a TV receiver, having appreciable noise (above 3 dB). For the very lowest-noise devices, it is more useful to rate a receiver in terms of a noise temperature. (The noise temperature is that which would have to be added to the antenna temperature to equal the total receiver noise.) As to radio noise in general, even astronomers can't keep up in their field without knowledge of antenna and receiver noise when they interpret weak galactic radiations uncovered by their radiometers.

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11. North, D. O. and Friis, H. T., "Discussion on Noise Figures of Radio Receivers," *Proc. IRE*, Vol. 33, pp. 125-127, 1945.

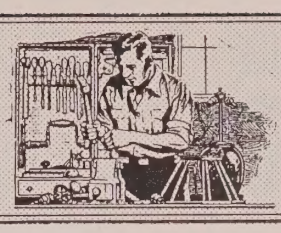
MEET REPORT - BLOOMFIELD

The AWA Spring Meet occurred smoothly at Bloomfield, NY on May 1, with about 30 vendors in the flea market. The Museum Annex auctioned a few hundred pounds of excess material - no breathtaking treasures, but some solid material with collector value. Likewise with the auction of members' goods after lunch.

MEET REPORT - TRANQUILITY

A record number of AWA members put a little Tranquility in their lives on May 15. Visitors came from as far as Maine and West Virginia. This year's event, in flawless weather, drew the added attendance that would have occurred last year but for "meteorological marginality." About 120 sellers offered good material, including a pair of Radiola IVs and a novel Boy Scout one-tuber. Bruce Roloson presented John Richardt, W2WIY, with a certificate expressing AWA's thanks for seven years' organization of this event. The after-lunch speaker was Ludwell Sibley, with a slide show on collecting military equipment. - LAS

EQUIPMENT RESTORATION



EDITED BY
LUDWELL SIBLEY, KB2EVN
44 E. Main St., Flemington, NJ 08822
Correspondence requires SASE for reply.

FIXING LOOSE TUBE BASES

Many past attempts have been encountered at refastening a loose brass or bakelite base to a tube's glass envelope. Most involved a celluloid cement (such as "Duco") or, in recent years, epoxy. Even white glue, such as "Elmer's," has been seen. All such attempts lead to unsatisfactorily sloppy results. Eventually, the base again comes loose.

There is a much better method. First, clean away all residue of any previous cement - scraping the glass envelope with a knife is acceptable. If a celluloid type of cement is on the base, it will usually peel off. Epoxy can be cleaned off the base with acetone. With a large darning needle, scrape the cement junction so that any residue of a previous attempt is removed.

Dilute clear fingernail lacquer with acetone: one part lacquer to two parts acetone. Be sure it is thoroughly mixed. Using the small brush in the nail-lacquer bottle, carefully apply the thinned mixture at the joint between base and envelope. It will immediately soak into the original cement. Continue application all around the base. Don't be afraid of using too much, although six or seven brush-loads, evenly spaced around the base, are usually sufficient. Stand the tube vertically and allow the lacquer to set for at least 24 hours. It will be found that the base adheres firmly to the envelope.

If any thinned lacquer inadvertently runs onto the base, let it dry. It can be removed later with acetone. Any dried lacquer on the glass envelope can be removed by judicious scraping.

This method has been used for over four decades and never once did it have to be repeated. Electrical qualities of the solidified lacquer seemingly are good enough that even high-voltage rectifiers suffer no impairment. Inter-electrode capacitances are not altered. **Rex C. Byle, WA9JWT**

[This idea has recently been tested in the OTB Hall of Science. It works just fine. No more Elmer's, thank you. - LAS]

TROUBLESHOOTING 201As

Tubes like 201As, but other big-pin types as well, are prone to showing open filaments, the result of failed solder joints in the base pins. (I once made a test: spent $3 on six flea-market "duds." Of the six, sure enough, one came back by resoldering the pins. Good odds.) This has been covered before in these pages ("'Restoring' Vacuum Tubes," Vol. 31 No. 2, pp. 24-25), along with the classic technique of rejuvenating a weak filament, but a reminder can't hurt.

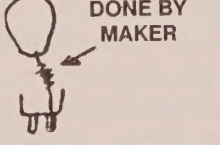
In testing sets and tubes, the active restorer will build up a group of these "open" tubes over time. However, resoldering every suspect tube on speculation is a slow process. To find out *right now* whether the open is in the pins or inside the envelope, simply connect an oil-burner transformer to the filament. If arcing is visible *inside* the tube, you know that the tube is open internally, i. e., hopeless, unless the rewelding trick from the May *OTB* comes through. However, if nothing seems to happen - no visible arc, no buzzing noise - the high voltage has broken down the bad solder joint and current is flowing through the filament - that is, this tube can be saved by resoldering. (See the following hint for more details.)

This trick sounds pretty violent but isn't. The typical oil-burner (or neon-sign) transformer has a grounded center-tap, putting out 5 kV from each side of the secondary winding into an open circuit. However, it is designed to limit the current that it can deliver to a low-resistance load (a tube filament, say) to a low value of only 23 mA or so. That current level can't harm anything, not even delicate hearing-aid tubes. The user has to be careful of shock hazard: 23 mA probably won't kill you, but it'll certainly get your attention. (Safety measures: use a three-wire cord on the transformer. Use short leads, insulated for high voltage, for the secondary wiring. Attach the leads, get clear, then plug in the transformer.)

This trick gives a fine saving of time. The first time I tried it, it uncovered a "dud" UX-250 which was resoldered successfully. - LAS

FIXING LEADS ON 201As

With respect to 201As, I've restored several by completely de-basing them, de-corroding the leads and then rebasing and resoldering. Sometimes just resoldering isn't enough - the lead wires need attention. I've encountered 01As which had twist splices:



So, obviously, if there is corrosion in the splice, no amount of careful resoldering of the base pins alone will complete the filament circuit. The tube must first be de-based.

Berj Ensanian, KI3U

(Continued on p. 46)

THE VACUUM TUBE

EDITED BY

BRO. PATRICK DOWD, F.S.C., W2GK

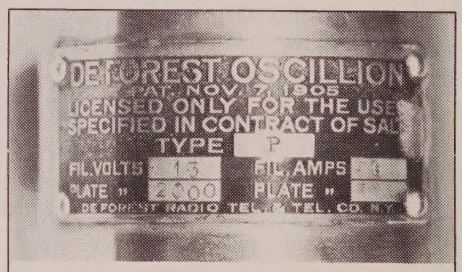
THE DE FOREST PO OSCILLION

William J. Condon

3642 McLaughlin Ave., Los Angeles, CA 90066

Reprinted from *SCARS Gazette*, Vol. 8 No. 1.

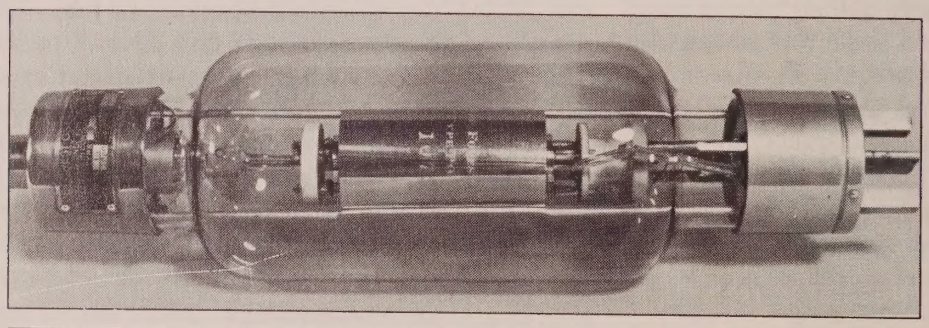
The tube in the long photo is the type PO power oscillator, one of the larger De Forest power tubes of the early '20s. The PO was one of three tubes in the P-series, the others being the PM modulator and PR rectifier. The PO had the general size and shape of the RCA UV-204, and used similar end fittings. The filament "pins" were square rather than round but the tube will plug into the UV-204 socket.



A mystery: de Forest received none of his numerous patents on Nov. 7, 1905. His Audion invention was the next year.

Intended for use only as a power oscillator, the PO used a straight tungsten filament rated at 6 amps at 15 volts. The internal construction was quite different from the UV-204 and was designed to minimize inter-electrode capacity, allowing full-power operation at 2.5 meters (120 MHz). Several Isolantite pieces were used as part of the element-support structure, probably the earliest use of this material for power-tube construction. This tube was rated for 500 watts input and about 250 watts output and was capable of dissipating the full 500-watt input for brief periods without damage.

An unusual feature of the PO was the brass name plate riveted to the nickel-plated plate cap. The smaller photo shows this name plate in close-up and reveals several interesting items. Since the company name is listed as the De Forest Radio Telephone & Telegraph Co., this tube must have been made before the company was reorganized into the De Forest Radio Co. in 1924. Also note that the term "Oscillion" is still being used to denote a power tube even though its original usage (1915) was to describe a low-power oscillator tube.



The PO had a list price of $110, the same as the UV-204. Apparently the De Forest P-series tubes did not enjoy any great commercial success, as they are extremely difficult to find today.

(Continued from p. 21)

plies multiplicative modulation of RF by the oscillator and consequent production of the difference frequency to form the 90-kHz IF.

As I have said, I had never come across the Ultradyne arrangement before; but I found a description on p. 156 of George Sterling's Radio Manual (2nd ed., 1929), where it is attributed to "the late" Robert E. Lacault, who had designed the Ultradyne sets beginning in one described in *Radio News* for December 1923.

Since the multiplicative mixing takes place in the electron stream following the grid, there will be no coupling of the oscillator to the antenna circuit apart from that through the triode anode-grid capacitance. The Ultradyne would therefore be relatively free from the oscillator-radiation troubles which beset the usual additive mixers of early superhets. Additionally, Sterling says that "the circuit is especially sensitive to weak signals," and this could indeed be true since, as a multiplicative mixer, the tube does not have to work on the low-slope bottom bend of the anode characteristic.

Certainly it works well in my receiver, but whatever its advantages, the Ultradyne does not appear to have set the world on fire. Although virtually unknown in England, I learn that several models with the Ultradyne name were produced around 1924 by the Phenix Radio Corporation of New York and that our Editor (the fount of all knowledge) actually owns one. I would be interested to hear of any other examples of use of the technique.

ANNUAL CONFERENCE

The Antique Wireless Association

"An amateur organization devoted to the history of wireless"

THRUWAY MARRIOTT, ROCHESTER, NY, SEPT. 22-25, 1993

WELCOME BACK! At our 32nd annual conference, collectors and history enthusiasts will convene, exchange equipment, and learn more about the development of radio and electronics. If you have never been to our yearly "reunion," why not give it a try? Rochester (Henrietta) is just north of upstate New York's beautiful Finger Lakes region, easily reached by car or plane. The site is 26 easy miles from the Museum at Bloomfield.

Advance registration is encouraged. This will allow preassembly of registration material for quick check-in, and preassignment of flea-market spaces. Preregistration, using the enclosed card, can be made through Richard Ransley, Box 41, Sodus, NY 15441 before Sept. 7. Unlimited registration at the door.

The Thruway Marriott is a full-sized, full-service hotel. It offers special nightly rates ($78 single, $88 double, $90 triple, $100 quad) up to August 23. For info or reservations, call (716) 359-1800. The Marriott has high-quality restaurant facilities, and other lodging and eating places are nearby.

The hotel is reached from Exit 46 of the New York State Thruway (I-90): take I-390 north to NY 253 west, to NY 15 south. For visitors arriving by air, the location is about seven miles or 15 minutes from the airport. There is shuttle service, 7 AM - 11 PM (specify the *Thruway* Marriott).

The special theme for this year is "Westinghouse." It is planned to introduce AWA Review, Vol. 8, at the Conference. The Book Fair is being expanded to three days.

Conference Chairman:	Bill Fizette
Program Chairman:	Lauren Peckham
Contest Chairman:	Ralph Williams

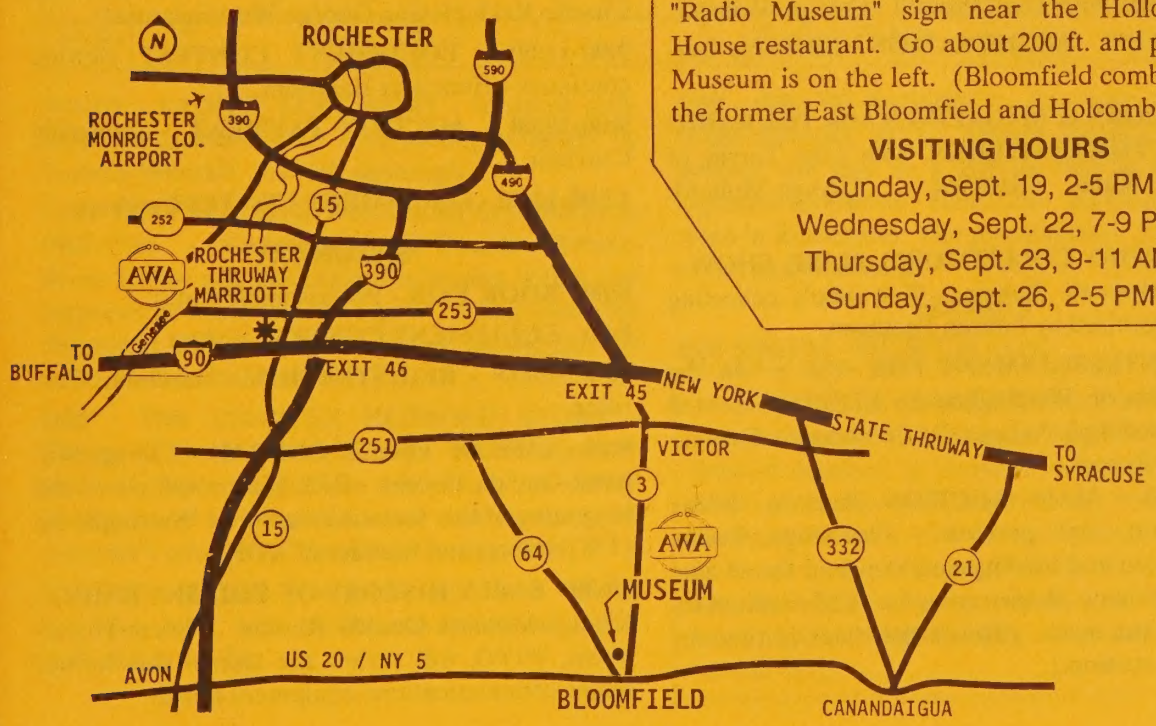
AWA ELECTRONIC COMMUNICATION MUSEUM

Village Green, Bloomfield, NY

See the area map. Directions from the hotel: turn right (south) on NY 15. At Avon (9.5 mi.), turn left (east) on NY 5/US 20. At Bloomfield (16 mi.), turn left at the brown "Radio Museum" sign near the Holloway House restaurant. Go about 200 ft. and park. Museum is on the left. (Bloomfield combines the former East Bloomfield and Holcomb.)

VISITING HOURS

Sunday, Sept. 19, 2-5 PM
Wednesday, Sept. 22, 7-9 PM
Thursday, Sept. 23, 9-11 AM
Sunday, Sept. 26, 2-5 PM



SUNDAY

2:00-5:00 PM - MUSEUM open.

WEDNESDAY

6:00 AM - FLEA MARKET opens (through 5:00 Saturday). Food service will be available on-site.

6:50 AM - SUNRISE.

8:00-5:00 - REGISTRATION for Conference - Assembly Corridor (see hotel floor plan).

2:00 - NEWS FOR SWLs, with discussion leader Bart Lee - Iroquois Ballroom.

4:00 - KEY & TELEGRAPH, session moderated by leading key collector Murray Willer, VE3FRX - Iroquois Ballroom.

7:00-9:00 - REGISTRATION - Assembly Corridor.

7:00-9:00 - AWA MUSEUM open at Bloomfield.

THURSDAY

8:00-9:00 AM - CHECK-IN of equipment for Communications Equipment auction - Cayuga-Mohawk Rooms.

8:00 - BOOK FAIR (to 5:00) - Pre-assembly Court.

8:30-12:00 - REGISTRATION - Assembly Corridor.

8:30 - BUS DEPARTS for AWA Museum from front of hotel. One trip, signed-up in advance at the AWA registration desk, $5.

9:00-11:00 - AWA MUSEUM open for bus tour and those who wish to drive.

9:00 - COMMUNICATION-EQUIPMENT AUCTION - Cayuga-Mohawk Rooms. Col. Ed Gable, K2MP, auctioneer. Post-1930 communications equipment, such as receivers and transmitters by National, Hallicrafters, or Hammarlund. No bidding card needed; sales are seller-to-buyer.

11:00 - DXING WITH THE WESTINGHOUSE RC RECEIVER, with Todd Prowell - Cayuga-Mohawk.

1:00-5:00 PM - REGISTRATION - Assembly Corridor.

1:00 - BOOKS & MAGAZINES FOR THE RADIO COLLECTOR-HISTORIAN, with John Terrey of *Antique Radio Classified* - Cayuga-Mohawk Rooms.

3:00 - RADIO COLLECTOR'S SLIDE SHOW - Cayuga-Mohawk Rooms. "See who's collecting what," organized by Lauren Peckham.

7:00 - ENTERTAINMENT FOR ALL - "On the Air," a film on Westinghouse's KDKA, presented by the Pittsburgh Antique Radio Society - Cayuga-Mohawk Rooms.

7:00-10:00 - MAIN AUCTION check-in, bidder registration, and preview - Onondaga Room. Registration and bidding card are good for all auctions on Friday. Registration fee of $2 credited toward any purchase. (This is **the** check-in time for the main auction.).

7:00-10:00 - OLD-EQUIPMENT CONTEST: check-in of entries - Henrietta Ballroom (Salons A, B). This is **the** time to bring in displays.

FRIDAY

8:00 AM - AUCTION PREVIEW (bidder registration and preview only) - Onondaga-Seneca Rooms.

8:00 - BOOK FAIR - Pre-assembly Court (to 5:00).

8:00-11:00 - Equipment Contest judging - Henrietta Ballroom.

8:30 - ANNUAL SIGHTSEEING EXCURSION, tour and lunch ($49). Meet in the hotel lobby.

8:30-NOON - REGISTRATION - Ass'y Corridor.

9:00 - VACUUM-TUBE AUCTION - Iroquois Ballroom. Col. Bruce Roloson, auctioneer.

10:30 (±) - PAPER-COLLECTABLES AUCTION, continuing from tubes.

11:00 (±) - NOON - GENERAL AUCTION, continuing from paper collectables; includes gear donated to support Museum maintenance.

11:00-NOON - EQUIPMENT CONTEST entries open for viewing - Henrietta Ballroom.

1:00-4:30 PM - GENERAL AUCTION continues.

1:00-5:00 - EQUIPMENT CONTEST viewing continues - Henrietta Ballroom.

1:00-5:00 - REGISTRATION - Assembly Corridor.

4:00 - AMATEUR-RADIO SEMINAR - Cayuga-Mohawk Rooms. Bob Raide, W2ZM, and Mike Raide, KF2MW, will review the 1993 OT Contest and operation of the AWA Net(s). Bruce Kelley, W2ICE, will show the film "Laying the Atlantic Cable."

6:30 - HAPPY HOUR - Preassembly Court.

7:00 - CONTEST-AWARDS DINNER - Iroquois Ballroom. Cash bar available. Special program by Charlie Ruch playing George Westinghouse!

9:00-11:00 - EQUIPMENT CONTEST viewing continues - Henrietta Ballroom.

9:00-10:00 - AUCTION PAYMENT - Assembly Corridor.

11:00-12:00 - EQUIPMENT CONTEST pickup.

SATURDAY

8:00 - BOOK FAIR - Pre-assembly Court.

8:00 - EQUIPMENT CONTEST pickup.

8:30-NOON - REGISTRATION - Assembly Corridor.

9:00 - LIFE OF FRANK CONRAD - Cayuga-Mohawk-Oneida Rooms. Rick Harris will cover the biography of this famous inventor at Westinghouse (178 patents) and founder of KDKA.

10:30 - EARLY HISTORY OF COLLINS RADIO - Cayuga-Mohawk-Oneida Rooms. Parker Heinemann, W1YG, will review the rise of this former major communications-equipment maker.

1993 AWA CONFERENCE - EASY REFERENCE

	WEDNESDAY SEPT. 22	THURSDAY SEPT. 23	FRIDAY SEPT. 24	SATURDAY SEPT. 25
6:00	**Flea Market** Open			
8:00	Registration Open	**Book Fair;** Checkin for Comm.-Eqpt Auction	**Auction Preview; Book Fair;** Contest Judging	**Book Fair;** Contest Pickup
8:30		**Bus to Museum;** Registration Open	**Annual Excursion;** Registration Open	Registration Open
9:00		**Comm.-Eqpt Auction; Museum Open**	**Tube Auction**	**Life of Frank Conrad**
10:30			**Paper Auction**	**History of Collins**
11:00		**DXing the RC Receiver**	**General Auction;** Contest Viewing	
12:00				Ladies' Luncheon
1:00	Registration Open	**Books & Magazines;** Registration Open	**General Auction;** Registration Open; Contest Viewing	
1:30				**Pre-1910 Gear**
2:00	**News for SWLs**			
3:00		**Radio Collectors' Slides**		**Charles Herrold Story**
4:00	**Key & Telegraph**		**Amateur Radio; Atlantic Cable**	
5:30				Mixer
6:30			Happy Hour	
7:00	**Museum Open;** Registration Open	**"On the Air" Film;** Main-Auction Checkin; Contest Checkin	**Awards Dinner**	**Grand Banquet** with Historical Electronics Museum
9:00			**Contest Viewing;** Auction Payment	
11:00			Contest Pickup	

NOON - LADIES' LUNCHEON - Iroquois Ballroom. Luncheon with entertaining program by Jeannie Wenrich, plus gift drawings.

1:30 - ELECTRICAL & WIRELESS APPARATUS, PRE-1910 - Cayuga-Mohawk-Oneida Rooms. Bruce Kelley will moderate this session with a few surprises on *really* old-time gear. Bring items for discussion, with special recognition for the earliest radio or electrical artifact!

3:00 - THE CHARLES HERROLD STORY - Cayuga-Mohawk-Oneida Rooms. Mike Adams of *Radio Collector* video fame will review the career of this early technical educator and operator of America's *other* "first" broadcast station, SJN.

5:30-7:00 - MIXER - Pre-Assembly Court. Members can relax with conference speakers, AWA staff, etc. Cash bar.

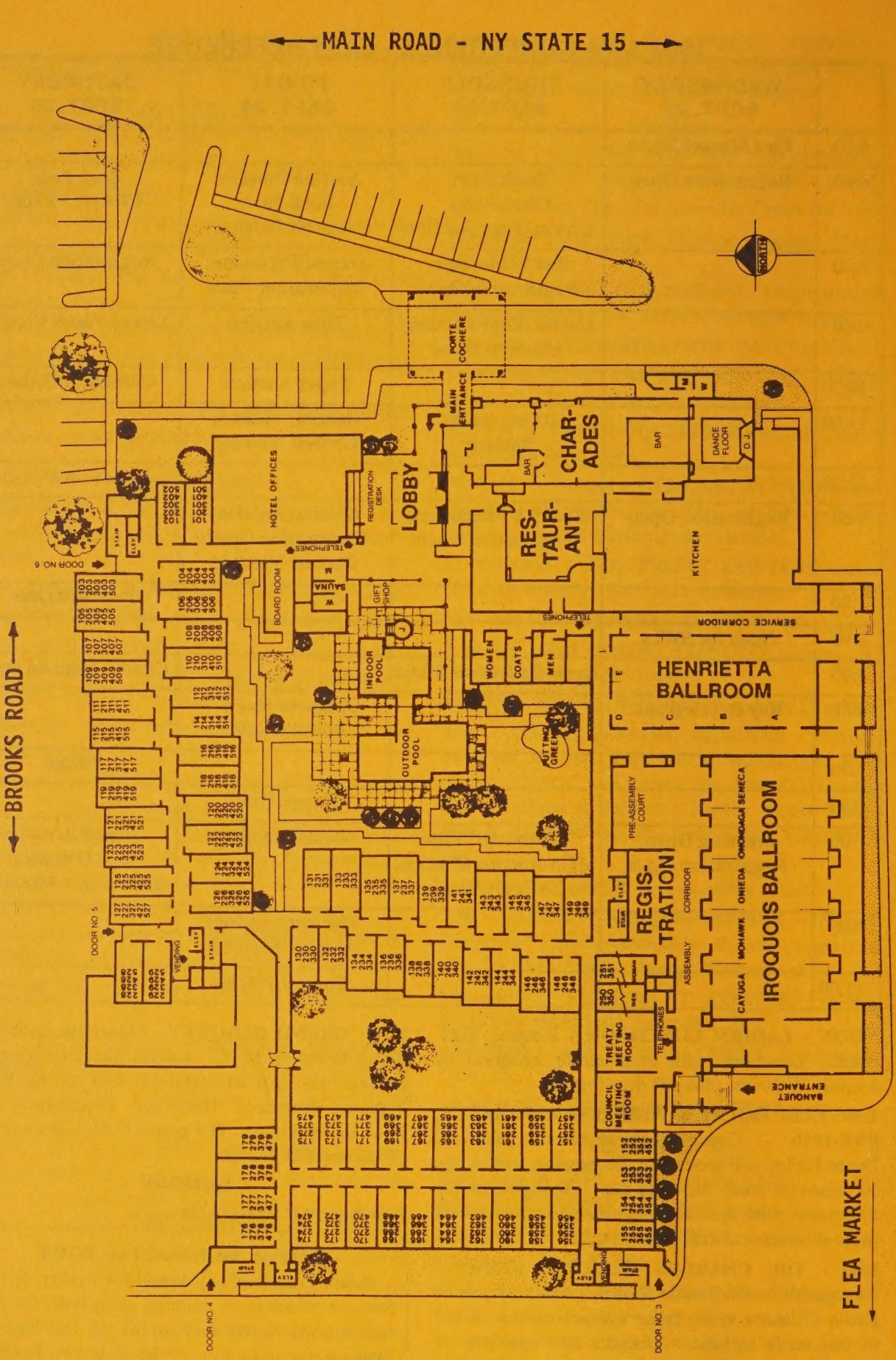
7:00 - GRAND BANQUET - Henrietta Ballroom. Bruce Roloson, M. C. Joseph Meagher as guest speaker will give us a remote visit to the Westinghouse-sponsored Historical Electronics Museum in Baltimore. The grand finale! An evening of fun and fellowship.

SUNDAY

2:00-5:00 PM - MUSEUM open.

ANNUAL SIGHTSEEING TOUR

A fun excursion is planned for Friday, to the Seward mansion in Auburn, with lunch at the well known Krebs Restaurant on the lake in Skaneateles and a tour of the Coverlet/Textiles Museum in Palmyra on the Erie Canal. Cost: $49, including transport, admissions, luncheon, taxes, tips, etc. Sign up early at the AWA registration desk.


MAIN ROAD - NY STATE 15
BROOKS ROAD
FLEA MARKET
NORTH
PORTE COCHERE
MAIN ENTRANCE
HOTEL OFFICES
REGISTRATION DESK
LOBBY
CHAR-ADES
BAR
DANCE FLOOR
D.J.
RES-TAUR-ANT
KITCHEN
SERVICE CORRIDOR
TELEPHONES
DOOR NO. 6
SAUNA
GIFT SHOP
BOARD ROOM
INDOOR POOL
OUTDOOR POOL
WOMEN
COATS
MEN
SITTING GREEN
HENRIETTA BALLROOM
PRE-ASSEMBLY COURT
REGIS-TRATION
CORRIDOR
ASSEMBLY
IROQUOIS BALLROOM
CAYUGA
MOHAWK
ONEIDA
ONONDAGA
SENECA
TREATY MEETING ROOM
COUNCIL MEETING ROOM
BANQUET ENTRANCE
DOOR NO. 5
VENDING
DOOR NO. 4
DOOR NO. 3

RULES AND CONDITIONS

EVENTS: Admittance to any activity, flea market included, requires a registration badge.

FLEA MARKET: Opens 6:00 AM on Wednesday. New York State sales-tax forms will be available; AWA not responsible for sales or tax. Neither AWA nor the Marriott is responsible for security of personal property in the flea-market area. We are asked to confine market activity to the designated area; in particular, to avoid the NY State Thruway right-of-way. KOA and other campgrounds are available in the vicinity. *No overnight sleeping in the flea-market area.*

AUCTIONS: 10% of all auction sales donated to AWA Museum Fund. AWA not responsible for tax or merchandise on any auction. AWA reserves the right to refuse nonconforming items. New York State law forbids an auction seller bidding on his own material. **COMMUNICATIONS EQUIPMENT AUCTION**: *Comm gear only, please*; no test equipment, broadcast items, literature, parts, or other unrelated items. No limit on number of items. **TUBE, LITERATURE, AND GENERAL AUCTIONS**: No consoles, boxes of magazines, non-"antique" items, or junk. Up to three items or lots of items per person (one piece of test gear max.) for the general auction, and five items or lots of items for the tube auction. For tubes, early types are preferred. Indicate if the filaments are good. Please remove bulky outer wrappings so potential bidders may view tubes. Place grouped items in a box, or tie together with tape, rubber bands, or string. Please remove equipment from the auction room by 6 PM.

OLD-EQUIPMENT CONTEST

CONDITIONS

Location: Henrietta Ballroom, Salons A & B. Check-in: Thursday, 7-10 PM, the only time to submit entries. Participants may enter one to three categories. Guard on duty at all times, but please provide security for small items via suitable display cases; remove gear by 11 AM Saturday.

PLAQUE AWARDS

Exhibit: "best presentation"; **Eunice Thompson**: "best of show"; **Elle Craftsman**: "best homemade receiver"; **Transmitter**: "best homemade or restored transmitter."

CATEGORIES

Categories are in three groups: Theme, Standard and Craftsman. The theme categories reflect the Conference's central thread, "Westinghouse." The Standard categories are for exhibitors bringing items from their collections rather than preparing something special for the theme. A new group this year lets the craftsmen among us show the ways that conservation and restoration add value and interest to any collection.

THE WESTINGHOUSE CATEGORIES

1. COMMERCIAL EQUIPMENT, ANY PERIOD. Thinking of major U. S. electrical companies, Westinghouse comes immediately to mind. It touched nearly every field related to communications, from the alternator to broadcasting. Many artifacts from Westinghouse history are in private collections. Bring in your choicest pieces and show the breadth of the Company's activities. Test gear belongs in this category, even if related to power generation.

2. TUBES. Few companies in the world had a longer or broader history in tube development. From the incandescent light through X-ray tubes and radio amplifiers to power rectifiers, thyratrons, and microwave amplifiers, Westinghouse covered the field. If you don't have a predecessor of the WD-11, bring a display of metal tubes or one of the big tubes from a radar transmitter.

3. EQUIPMENT, BEGINNING TO 1930s. At the start of broadcast radio, RCA was the sales agency for receivers produced by GE, Westinghouse and WSA. Before the RCA agreement and again in the late '20s, Westinghouse sold sets under its own name. Sets telling the story of the first four decades fit here. With enough entries, we will make subcategories, one for sets made before the agreement and the other for Westinghouse sets built for RCA and after the breakup. All must be traceable to Westinghouse manufacture.

4. POST-WW-II RECEIVERS. Some AWA members collect equipment in use when they started "to sit up and take notice." Westinghouse made some interesting receivers after WW II: portables, stylish table models, and consoles. We have space for your best.

5. TV TRANSMISSION & RECEPTION. Because RCA was so aggressive in the business, we don't realize how much others did. Westinghouse was competitive in television development from the start of its electronic phase, operating stations and making equipment. Their work on pick-up, transmission, control, reception and display equipment is now truly historical. If you have an outstanding receiver, or some picture processing gear, this is your category.

6. MILITARY EQUIPMENT. America's electronic strength in both World Wars reflected the development and manufacturing capability of radio firms like our theme company. Artifacts and illustrative documents about Westinghouse's military contributions are sought, like one of the many radio receivers or transmitters. Other military equipment will be accepted.

7. DOCUMENTS & ADVERTISING. Entries in previous categories featured hardware. In this one, pictures, biographical material, and similar

software are expected. Don't forget the Westinghouse broadcasting network.

THE STANDARD CATEGORIES

8. PASSIVE RECEIVERS. Any detecting device, not including vacuum tubes or solid state amplifying devices, whose purpose is to convert radio energy into intelligence.

9. ONE- & TWO-TUBE RECEIVERS. Any receiver using one or two tubes. A tube that includes multiple electron streams in one envelope will count as one tube.

10. THREE-TUBE RECEIVERS. The detector/two-stage is most often found here, but reflexes and special-circuit sets are sought.

11. FOUR- & FIVE-TUBE RECEIVERS. Three-dialers, electric sets with some special feature, and others from all periods fit here.

12. SIX-OR-MORE-TUBE RECEIVERS. Superhets are the usual entries, including most communication receivers, but many others qualify, especially the electric radios of the '30s.

13. SPARK TRANSMITTERS & ARTIFACTS. Do not hesitate to enter a major piece of spark equipment if you think it is rare or significant.

14. VACUUM-TUBE TRANSMITTERS. Some sets for this class are old, some not so old, most home-built. Entries have been predominantly amateur-operated but commercial gear is welcome.

15. NOVELTY RADIOS. Entries here may range from Mother's Oats crystal sets to Teddy-Bear transistors, the All-American Five, etc.

THE CRAFTSMAN CATEGORIES

16. RESTORATION OF APPEARANCE. While there is no requirement for a particular kind or size of set in this category, the description of the work done is an important part of the entry. The critical element is the appearance of the radio, including woodwork, escutcheons, dials, knobs and other visual details.

17. RESTORATION OF OPERATION. This is the category for those craftsmen who artfully substitute modern parts for old failures. The new electrolytic in the old can, and the transistor or IC hidden in the tube base, are starting examples.

18. NEW-FOR-OLD. We have had many special entries of equipment or devices that did not pretend to be old. Each was a construction using functional components to do a task directly related to radio history. An excellent example was last year's operating TV system showing disk scanning. A previous entry was the Leutz Model L built from the ground up, using many parts made in the contestant's shop. Imagination, craftsmanship and effective operation are the main judgement values.

FLEA MARKET

Last year, AWA made several improvements in the flea-market operation. Learning from that experience, plus taking into account all comments from the membership, the Conference Committee has made the following plans for 1993.

First, the market will run only in conjunction with the Conference dates from Wednesday morning to Saturday afternoon. *No* flea-market sales will take place at the hotel parking lot prior to Wednesday. The flea-market area will be sealed off, unavailable to anyone until the gate opens at 6:00 AM Wednesday. The prohibition of non-conference flea marketing is a matter of hotel rules and our Special Use Permit required by the Town of Henrietta.

Second, there will be only one class of site. All sites are treated the same and are issued randomly on a first-come-first-sold basis. Each member may pre-register for one or two sites, at $20 for the first and $35 for the second. Two sites to one member will always be adjoining. Pre-registration is highly recommended to assure a pre-assigned, numbered spot on the paved area. Everyone wanting to participate will get a spot. However, the paved-area, pre-numbered spots will probably sell out during the preregistration period. At that point we will start assigning spots on the grass on the Thruway side of the parking lot.

Third, flea-market headquarters will be located at the entrance to the market. Look for the big banner. This will be a full-service area where one can pay membership dues and registration fees, and sign up as a flea-market seller. Everyone needs to register for the Conference - the flea market is only a portion of overall Conference activities. A non-member wishing to sell in the flea market is welcome to join, paying $12 dues, $13 Conference registration, and $20 for the first site.

LODGING AND FOOD

While the Marriott is clearly the most convenient location, other accommodations are available, north of the hotel on or near NY 15. In order of closeness, they are:

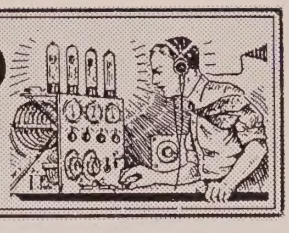
0.6 mi.: Day's Inn, (716) 334-9300
0.8 mi.: Red Roof Inn, (716) 359-1100
1.0 mi.: Microtel, (716) 334-4000
1.0 mi.: Highlands Motor Inn, (716) 334-4280
1.1 mi.: Super 8 Motel, (716) 359-1630
1.9 mi.: Dorkat Motel, (716) 334-7000

The main dinner restaurant in the area is the Cartwright Inn, south of the hotel on NY 15. Utility food (Perkins, Burger King, McDonald's, etc.) is available in the motel area.

CONFERENCE AUCTION REPORTS

In past years we have made the results of auctions at the Conference available on disc (or paper) to individuals and news journals wanting them as inputs to price guides and the like. We plan to do the same this year, immediately after the Conference. For details, contact the Editor.

AMATEUR RADIO



EDITED BY
Mike Raide, KF2MW
Box 181, Bloomfield, NY 14443
Please include SASE with correspondence.

Here are the results of the 1993 AWA OT contest. Congratulations go to W2ZM, Bob Raide, for the highest score. Not bad, considering it was his first year. A couple of familiar stations were not on the air this year: W2AN, Bruce Kelley, and W2BJI, "Cuz," were both ill during the contest and were unable to operate. I notice that participation was down a bit (85 logs submitted, vs. 99 last year), and hope that things will pick up next year. This was my first year contesting as well, but I didn'et do as well as W2ZM!

The oldest transmitter was a 1926 one-watter at W3HWT; oldest receiver was a '26 design at the same station.

I received many good comments from the membership, and appreciate the support. I had fun coordinating the contest and participating, and plan to do it in future years.

73, **Mike Raide, KF2MW**

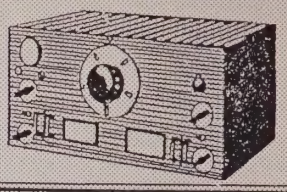
TOP TEN SCORES

1.	W2ZM	1629	6.	W2UK	828
2.	KC0CW	1440	7.	W6DJX	801
3.	VE3CLX	909	8.	W2LYH	636
4.	W1YG	876	9.	W4VBX	600
5.	W3OER	852	10.	W2HBE	567

CALL	EQUIPMENT	SCORE
W1BPI	MOD	93
W1FPZ	'34 47-46-210s; '34 FB-7	117
W1KSK	'37 6L6 xtal; '37 HRO	558
W1MCG	'38 Gonset, '32 Comet Pro	228
W1NV	'39, T55,'29 45 Hartley; '39 Howard, '34 3TRF	6
W1SZJ	'29 Hartley, MOD GRC 109; MOD BC-348	66
KB1UV	MOD	50
NV1X	MOD; '38 RME-89	30
W1YG	'38 6V6 xtal-6V6; '38 HQ-120	876
W1YJ	MOD	9
W2AAU	MOD	75
K2ANC	MOD	54
W2DTF	MOD	116
W2EG	'37 6L6-807; '37 HRO	342
W2ER	MOD, '39 Gross rep; MOD, '38 RCA	555
W2EZ	'27 210 Hart; '38 HQ-120	261
W2FB	MOD	162
W2FCH	MOD	195
W2FW	'34 801-801; '34 FB-7	126
K2GBR	MOD	15
N2GIG	'39 Meissner; '37 HRO-M	108
W2HBE	'37 42 xtal; '33 57 regen	567
AA2ID	'37 6L6 xtal; MOD	81
W2IXH	'40 ECO-6L6; '35 SP-200	550
W2KFG	'36 6A6 xtal-6A6 @ 9 W; '39 NC-44A	477
W2LL	MOD	216
K2LP	6L6 ECO-807-860; MOD, HQ-120	555
W2LV	MOD	66
W2LYH	'36 6K7-6V6-6L6; '36 HB super	636
WB2MVK	'39 6V6-6L6, '39 HB 4-T TRF	
KF2MW	'40 P. 6L6s @ 30 W; '38 HQ-120	117
K2RY	'36 47-46-210 @ 30 W; '36 2.5-V HRO	81
W2UK	'37 RCA ACT-40; '37 HRO	828
W2ZM	'29, 809-809s, '37 211 Hartley; '38 SP-200, '39 HQ-120	1629
W2ZUX	MOD	46
W3DB	'29 211 Hart. @ 10 W; MOD	156
W3EAN	MOD; MOD, Sky Buddy	102
WB3HLH	'41 6V6 xtal-6V6 @ 10 W; '41 SX-25	414
W3HWT	'26 UV-210 Hartley; '24	243
W3INV	'36 2A5 xtal-210 @ 40 W; '33 autodyne	171
W3OER	'29 201A TNT @ 2.5 W; '28 Pilot Wasp	852
W3RG	MOD	36
KB3SI	MOD	105
AF3V	MOD	50
W3VVS	'39 Signal Shifter; '38 HQ-120X	198
W4CBG	MOD; '41 HRO	120
K4MGG	MOD	58
W4OTN	'38 xtal+PA @ 30 W; '38 HQ-120X	63
AA4RM	'41 Stancor 69; '36 RME-69	459
W2UDI/4	MOD	120
WA4UM	MOD	28
W4VBX	'38 6J7 ECO et al.-6L6 @ 18 W; '36 HRO	600
K5CF	'40 Thordarson/811 @ 75 W; '40 RME-70	159
W8KG1/5	OT	369
WA5VCR	'41 Meissner, MOD p-p 6L6; '36 HRO	87
W6AD	MOD	210
K6AQB	MOD	4
K6DIA	'38 6L6-T40 @ 65 W; '38 HRO	45
W6DJX	'38 T-21; '39 HRO	801
K6ILM	'40 6L6 @ 30 & 2.5 W; '34 FB-7	267
K6NL	'37 6L6 xtal-203 @ 100 W; MOD	8
W6SKQ	MOD	84
W6TDP	'37 Utah 80W; '39 S-19R	252
W6TQ	'38 6L6 xtal-807; '36 HRO	432

(Continued on p. 42)

THE COMMUNICATION RECEIVER



EDITED BY
WILLIAM FIZETTE, K3ZJW
RD #1 Box 55, Henryville, PA 18332
All correspondence requires SASE for reply

THOSE NATIONAL 6-PRONG PLUG-IN COILS

William B. Fizette, K3ZJW

INTRODUCTION

Except for the power supplies, no group of National Company products is as confusing to the beginning collector as the 6-prong plug-in coils for the receivers of the 1930s. I refer, of course, to the sets personified by the SW-3 and SW-5, although there were several others.

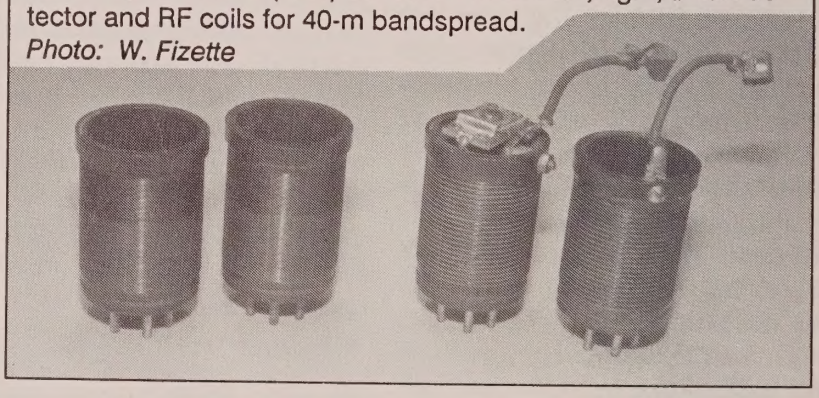
Our Editor, on acquiring one of these, a SW-45, set out to master the conundrum of the 6-prong coils. This review includes material researched by both him and the writer, with the aid of Paul Bohlander, W3VVS, and summarizes the information needed by a collector who wishes to make one of these receivers operational.

Fortunately for us, the subject has attracted many writers over the years, and there is no shortage of information about these coils. Besides the various National Company catalogs, there are the early writings of Robert Kruse, James Millen and Dana Bacon, followed by more recent articles by National experts John Nagle and Bill Orr. Recently, Reno Ruggere and Jim Troe attacked the problem with a story in the *ARCA Gazette*. The references at the end of this article list ample source material for the serious collector-restorer.

THE R-39 STORY

The SW-2 of 1928 was Nation-al's first attempt at a short-wave receiver. Designed for both SW and experimental TV reception, it used a set of four coils covering 2.5-115 meters (2.6-120 MHz). These coils, wound on 2" bakelite tubing, varied in "Q" and inductance depending on the weather, and the receiver performance suffered accordingly. The National SW-4 and early 3-tube regenerative receivers also used coils wound on the usual forms of the day, bakelite filled with wood flour with a coloring agent added and molded in steam presses.

Left: a pair of #15 (blue) coils for 115-200 m.; right, #13A detector and RF coils for 40-m bandspread.
Photo: W. Fizette



Enter the team of Millen and Kruse and the SW-5 receiver [3]. Along with other research involving hum and the use of AC power packs, they attempted to make the receiver more stable. The problem of frequency swings with environmental changes was given to the Radio Frequency Laboratories of Boonton, NJ, who ascertained that it lay with the use of the hygroscopic wood-flour filler [7]. The Boonton Rubber Co., of the same town, developed an improved formula using finely ground mica as the filler for the bakelite resin [15], replacing the wood flour and coloring dye. Using electrically heated molds, they obtained a precision, high-Q coil form that permitted manufacture of stable and uniform inductors. The first production run was during the summer of 1931 [15].

THE SPECIAL PIN CONFIGURATION

The 6-prong coil form was developed prior to the introduction of the 6-pin "UZ" tube base about 1932, and is mentioned by Kruse in his article [2]. The decision was to provide independence for each of the three windings. National continued to make and sell the special form after 1932, realizing that it was both illogical to change something that was established, and was also a good source of revenue. They also continued to make receivers using them. No old tube bases here . . . the blanks or finished coils had to be purchased from National, who essentially controlled the market for this item.

The pins were in two groups of three, with the second group having a wider spacing. Thus the distinctive asymmetric format, made by no one else (that I am aware of) at the time.

GENERAL DESCRIPTION OF THE COILS

As with most National products of the 1930s, these were *quality*. The development work was done well enough that the design did not change,

TABLE 1. GUIDE TO CORRECT COIL SERIES FOR RECEIVERS

RECEIVER	TUBES	SERIES
SW-5	35 + 35 + 27 + P-P 27s	10-20
SW-45	35 + 35 + 27 + P-P 45s	10-20
DCSW-34	34 + 34 + 30 + P-P 31s	10-20
ACSW-58	58 + 58 + 56 or 27 + P-P 45s	60-70
Orig. SW-3 AC	35 + 35 + 27	10-20
6DCSW-3 (6 V)	36 + 36 + 37	10-20
2DCSW-3 (2 V)	32 + 32 + 30	10-20
ACSW-3	58 + 58 + 27 or 6C6 + 6D6 + 76	60-70
Universal SW-3	6J7 + 6J7 + 6C5 or 1N5 + 1N5 + 1A5	30-40

and once marketed, they continued on for years. Introduced in 1930 with the SW-5 as the "10-20" series, the last "30-40" series was still listed in the price list in catalog No. 700, 1947. The blank forms (XR-4, XR-5, and XR-6) were sold into the 1950s. The special 6-prong socket used was the XC-6C.

The forms were ruggedly molded of hard, dark-brown bakelite, 1-½" in diameter with a 2" winding field, with a ¼" reinforcing shoulder at the top. A 1/16" groove was machined into the form near the bottom for the "slot" winding, and a small groove in the top shoulder was usually (but not always) filled with colored paint for identification. These forms were very stable physically.

A feature unique at the time was the machining of wire grooves tailored to the individual windings, assuring that they would stay firmly in place. Inspection of coils that are over 60 years old confirms that the idea was a good one; the turns are right where they were put in 1930.

WHERE WERE THESE COILS USED?

Table 1 lists the various receivers by name and tube types, and gives the coils to be used. The SW-3s can be confusing, since there were a number of different models, but they can usually be identified by the tube designations on the sockets (assuming, of course, no untoward rebuilding by some previous owner.)

The coils also often appeared in home-construction projects, especially those in *QST* and the ARRL Handbooks of the day, probably due to the close working relationship between National and ARRL. A noteworthy example of this is George Grammer's simplified high-performance superhet described in *QST* for April, 1936.

By far the most use was in the SW-5 series and the SW-3, which enjoyed a production run of some 14 years. While some cross-use of coils is permitted among the various sets, not all the coils can be used in all the receivers, usually due to differing numbers of turns in the tickler (slot) windings [16].

The "slot" winding, incidentally, is used as the primary in the RF coil to minimize antenna-capacity effects. In the detector coil it becomes the tickler.

HOW MANY DIFFERENT TYPES WERE MADE?

Table 2 gives a master list of the 6-prong coils [19]. The first coils to be made, the "10-20" series, were color-coded with a paint dot on the bottom of the form and a matching color in the groove on the top. In 1932 the "60-70" series was introduced for use with the AC SW-58 and the AC SW-3 [10]. These had the coil number hot-stamped into the bottom. The last types, the "30-40" series, came on the market with the Universal SW-3 in 1940; these were also numbered on the bottom.

The initial "10-20" coils for the SW-5 covered 2.5-21 MHz, with 1.5-2.7 and 19-35 MHz optional. The 500-1500 kHz coils were added for the SW-45. Nos. 10, 10A, and 69-72 appeared after 1934, 22 and 72 after 1938 [19].

National catalog No. 144 [4] listed eight available sets, covering 9-550 meters (0.55-33.3 MHz) and selling for $42, a large sum in those days.

The bandspread (BS) coils may or may not be numbered; I have some of each. This probably reflects when the coils were made. Another anomaly has been noted with the BS coils: I have two sets in original boxes, 14A and 64A, apparently unused, with the numbers on the bottom *and* with color codes. However, in each case the RF coils are coded black and the detector coils red. Perhaps some knowledgeable reader will explain this.

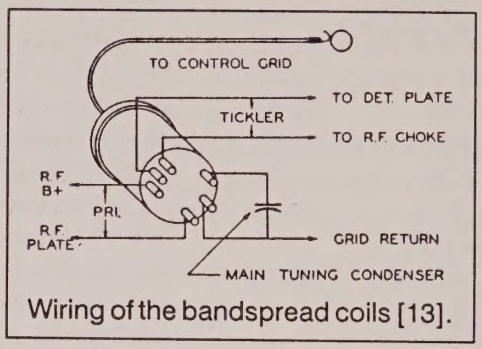
TABLE 2. SIX-PIN COILS FOR SW-3, SW-5, AND DERIVATIVES

RANGE MHz	RANGE METERS	SERIES 10-20 1930	SERIES 60-70 ~1933	SERIES 30-40 ~1940
0.09-0.16	2000-3000	22	72	42
0.15-0.22	1500-2000	21	71	41
0.19-0.28	1200-1500	20	70	40
0.25-0.39	850-1200	19	69	39
0.32-0.65	500-850	18 (Purple)	68	38
0.50-0.90	350-550	17 (Yellow)	67	37
0.69-1.50	200-360	16 (Orange)	66	36
1.5-2.7	115-200	15 (Blue)	65	35
	160 BS	15A (Blue)	65A	35A
2.5-4.5	65-115	14 (Green)	64	34
	80 BS	14A (Green)	64A	34A
4.2-8.0	40-70	13 (White)	63	33
	40 BS	13A (White)	63A	33A
7.0-12.0	23-41	12 (Red)	62	32
12.0-21.0	13.5-25	11 (Black)	61	31
	20 BS	11A (Black)	61A	31A
19.0-35.0	9-15	10 (Brown)	60	30
	10 BS	10A (Brown)	60A	30A

Tables 1 and 2: L. A. Sibley

THE BANDSPREAD COILS

A key article for students of the SW-3 is that by James Millen in *QST* for September, 1931 [7], in which he introduces the SW-3 to the short-wave fraternity. In the same article he describes the new band-spread coils using the tapped inductance. Another key reference is in *Radio News*, May 1931 [6].



Wiring of the bandspread coils [13].

Briefly, previous attempts to bandspread a tuning range involved removing plates from the tuning capacitor. National opted instead to tap down on the inductance, with the entire frequency-selection process now resting with the plug-in coil. This system made for a good circuit L/C ratio, giving sensitivity and stability. The general-coverage qualities of the receiver were unimpaired, and all coils, both GC and BS, tuned with a 90-pF variable capacitor.

Besides the tap on the secondary, each detector coil was fitted with a grid leak and grid capacitor inside the form, a shunt trimmer capacitor on the top of the form, and a lead with a clip to attach to the grid cap of the detector tube.

National quickly began to promote the coils as suitable for use with the existing SW-5, with no change necessary to the set. In separate publications, Dana Bacon and James Millen of National discussed the subject at length [6, 9].

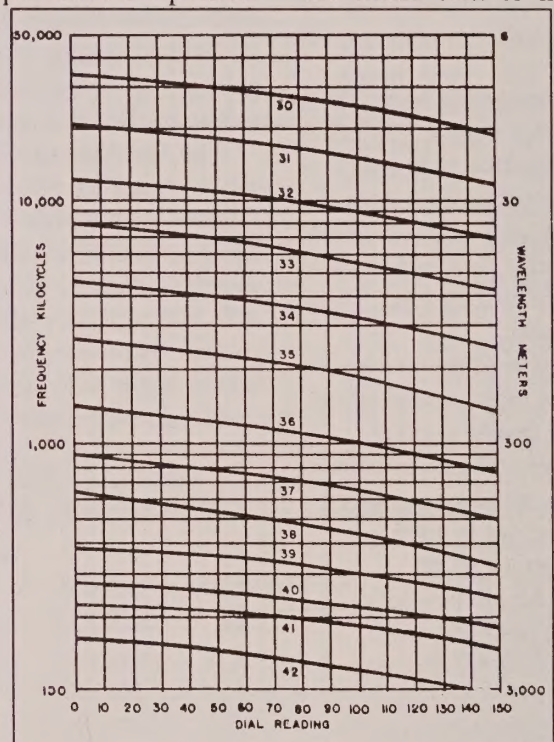
The following notes concerning these coils are taken from the instruction sheet packed with each BS coil set [11]:

1. The 11-A, 13-A, 14-A, and 15-A coils are for use in the AC SW-5, DC SW-5, AC SW-45, AC SW-3 (using 235 tubes), the universal SW-3 (DC) and the SW-34. The 61-A, 63-A, 64-A, and 65-A coils are for use in the SW-58 and the later model AC SW-3 using type 58 tubes.

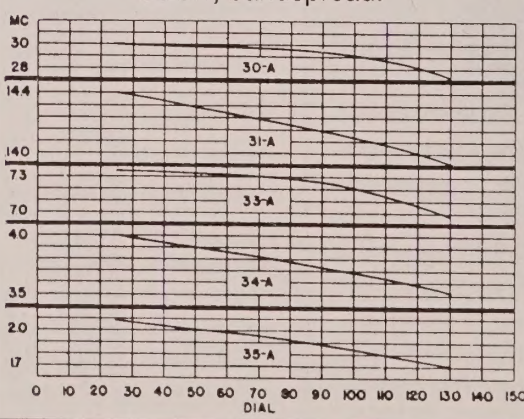
2. The detector coil is located at the left side of the receiver in the AC or DC SW-5 and the AC SW-45 models, and at the right side in the SW-58, SW-34, and all models of the SW-3.

3. When the detector coil trimmer is correctly adjusted, the high-frequency edges of the bands will be between 65 and 70 on the dials of the SW-5, SW-45, and SW-3 models, or between 30 and 35 on the dials of the SW-58 and SW-34. The spread may be increased or decreased by tightening or loosening the trimmer.

The serious collector may wish to consider that the bandspread coils were introduced to the market in late 1931 or early 1932 (by Feb. 1932 BS coils for the 20-, 40-, and 80-meter bands were included as standard equipment with every SW-3) and match his receiver and coils accordingly. The SW-3 had insulated posts on the sides of the shield cans to hold the unused internal grid leads when the BS coils were used. In contrast, the earlier SW-5s did not have these keepers, and while the BS coils were promoted, they were not shipped as standard equipment.



Calibration curves for the "30-40" series coils [13]: above, general-coverage; below, bandspread.



IDENTIFYING THE COILS

The color-coding in the "10-20" series is often missing or hard to distinguish, with the possible exception of the red-, white-, yellow- and orange-marked coils. The paint dot on the bottom is usually gone. The best way, in case of doubt, is to compare the windings with a turns chart (see Table 3) or with a known coil.

The "60-70" and "30-40" series are usually number-marked on each coil, making for positive identification. The BS coils may or may not be numbered; the early ones were not. Remember that the units with the mica padder on top and the grid leak inside the form are the BS detector coils. Also, some coils, specifically Nos. 36, 37, 38, and 42, are marked with a D or an R after the number; these are for the detector and RF stages, and are not interchangeable.

TABLE 3. WINDING SPECIFICATIONS FOR EARLY NATIONAL 6-PIN COILS

COIL	CODE	RANGE, METERS	SECONDARY TURNS	PRIMARY TURNS	TICKLER TURNS*	BS TAP**
11	Black	13.5-25	5-3/4 #16E, 5 TPI	4-1/6 #26 E, 5 TPI	3-1/8 #28 DSC	-
11A	-	20 BS	9-7/8 #22 E, 8 TPI	7-7/8 #34 DSC, 8 TPI	3-1/8 #28 DSC	2-1/3
12	Red	23-41	11-5/6 #18 E, 8 TPI	7-5/6 #34 DSC, 8 TPI	3-1/8 #32 DSC	-
13	White	40-70	19-5/6 #18 E, 14 TPI	12-5/6 #34 DSC, 14 TPI	4-1/8 #32 DSC	-
13A	13A	40 BS	21 #22 E, 14 TPI	16-1/6 #32 DSC, 14 TPI	4-1/8 #32 DSC	5-5/6
14	Green	65-115	34-5/6 #22 E, 24 TPI	21-5/6 #28 DCC, 24 TPI	4-1/8 #32 DSC	-
14A	14A	80 BS	34-5/6 #22 E, 24 TPI	21-5/6 #28 DCC, 24 TPI	4-1/8 #32 DSC	16-7/8
15	Blue	115-200	62-5/6 #24 E, 40 TPI	39-1/6 #32 DSC, 40 TPI	5-1/8 #32 DSC	-
61	61	13.5-25	6-1/3 #16 E, 5 TPI	5-7/8 #24 E, 5 TPI	2-1/8 #30 DSC	-
61A	61A	20 BS	9-7/8 #22 E, 8 TPI	7-7/8 #30 DSC, 8 TPI	3-1/8 #30 DSC	2-1/3
62	62	23-41	11-7/8 #18 E, 8 TPI	9-7/8 #22 E, 8 TPI	2-1/8 #30 DSC	-
63	63	40-70	19-7/8 #18 E, 14 TPI	12-7/8 #30 DSC, 14 TPI	2-1/8 #30 DSC	-
63A	63A	40 BS	21 #22, 14 TPI	15-7/8 #32 DSC, 14 TPI	4-1/8 #30 DSC	5-5/6
64	64	65-115	34-5/6 #22 E, 24 TPI	21-5/6 #28 DCC, 24 TPI	4-1/8 #30 DSC	-
64A	64A	80 BS	34-5/6 #22 E, 24 TPI	21-5/6 #28 DCC, 24 TPI	4-1/8 #30 DSC	16-7/8
65A	65A	160 BS	62-5/6 #24 E, 40 TPI	26-5/6 #30 DSC, 40 TPI	4-1/8 #30 DSC	26-1/8

E: Enameled; DCC: Double Cotton-Covered; DSC: Double Silk-Covered; TPI: Turns Per Inch
* In slot at bottom
** Turns from bottom

Table 3: W. Fizette, K3ZJW

RESTORING AND WINDING THE 6-PRONG COILS

Unfortunately, the passage of time and the advances in technology relegated most of the coils to the junk boxes of amateurs who had prized them in the 1930s. Those that can be found after all these years are often worn, chipped or even worse. If the original windings are still intact, I clean them by wiping on a coat of Butcher's woodworker's wax and then buffing lightly, taking care with the fine wires. Often the grid-clip leads from the BS coils are missing, and must be replaced. Do it right and use only the matching National No. 24 grid clip. If some of the strands of the grid-cap wire are broken, do a repair job or replace the wire.

If a coil must be rewound (there are a lot of these, unfortunately), match the machined winding grooves on the form to a known coil, and then duplicate the windings as closely to the original as possible. The silk- and cotton-covered wire used back then can often be salvaged from early junker BC sets (get as close as you can; the exact wire size is not critical), and the larger enameled wire obtained from Radio Shack or an electric-motor repair shop. Once I have a set of coils identified, cleaned and restored, I find that zip-lock sandwich bags make fine storage containers.

MAKING REPLACEMENT COILS

National marketed blank forms, and it is possible to wind your own coils with care. Also, coils can be made using repro forms and the instructions (a 16-page information summary on the SW-3) from James Fred, of Antique Radio Labs, RR 1, Box 41, Cutler, IN 46920 - see the catalog review in the May *OTB*, p. 65. An interesting approach to making a set of coils for the broadcast band is to use these forms with pre-wound Miller coils. Refer to the sidebar for details. Dana Bacon also tells how to make three sets of long-wave coils covering 850 to 2000 meters (150-350 kHz) [8], but the quantity of wire involved is considerable and could be hard to find.

Table 3 details the winding data for many of the coils, especially the early ones. I have seen homemade coils that were superbly done, differentiated from the factory-wound versions only by absence of the machined grooves.

For specifications for winding the 20-, 40-, and 80 meter BS coils, see reference 7. Originally [8], in the detector coils ("transformers" was the term used then) the grid leak was 5 megohms, the grid capacitor 100 pF, and the trimmer capacitor approximately 8 pF.

MISCELLANEOUS NOTES

It is worth while to try to get any of the coil sets working in any of the subject receivers. However,

MAKING BROADCAST COILS

A good simulation of the No. 16 coil for the upper part of the BC band can be made up easily with a blank form and, inside it, a P-70-RF coil available from Antique Electronic Supply. A tickler winding is added to the coil by winding seven turns of small (24- to 30-ga.) magnet wire on the form, in the same direction as the grid winding. The slug in the coil can be adjusted to give either 800-1510 or 820-1600 kHz as the tuning range. This saves the effort of winding a huge number of turns of fine wire. -LAS

if the detector fails to oscillate, the problem may be in the number of turns on the tickler (slot) winding. Later receivers with higher-gain tubes require fewer turns on the coil to make it work. In fact, the slot turns were progressively fewer from the "10-20" to the "60-70" to the "30-40" series.

Orr [16] suggests changing the slot windings, but from the viewpoint of a historian/collector I recommend this with good coils only as a last resort, as any change is obvious and degrades the antique value of the factory-wound coil. Another, perhaps preferable, approach would be to use the forms from James Fred and wind your own. If the set goes into oscillation with the regeneration control near mid-position, the slot winding is correct [16].

The long-wave coils are rare and may not work in the earliest SW-3s, due to the absence of a choke in the plate circuit of the detector tube [16].

Another rare National Company product is the NCC-10 two-piece metal storage cabinet, with space for 10 pairs of coils.

CONCLUSION

Few collectors, if any, have a complete set of all the six-prong R-39 plug-in coils. The "10-20" series is the most common, the "60-70" series not so available, and the last one, the "30-40" series, very uncommon indeed, probably due to low demand at the late date. Depending on the application of the individual receiver, National usually shipped four sets of the coils in the middle frequency ranges, commonly 1.5-21 MHz, for the short wave listeners, with band-spread amateur band coils for the amateurs. The BC coils for sets like the SW-45 were optional [19].

Space limitations preclude giving a complete set of turns data for the coils. However, if there is enough interest, I will publish all available information in a subsequent column. I have no turns data for the "30-40" series, and if any reader has this information, I would be indebted for a copy.

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(Continued from p. 37)

CALL	EQUIPMENT	SCORE
W6ZZ	MOD	42
W7BCT	'38 Stancor; '41 SX-28	18
W7LOG	'37 6V6-807 @ 30 W; '38 HQ-120	80
K7MO	'41 Meissner-813 @ 90 W; '36 HRO	468
W7SEH	'39 6V6 xtal-807 35 W; '36 HRO Jr.	270
K7SKP	MOD; '38 NC-101X	79
K2WW/7	MOD	72
K7YIR	'38 Stancor 125, '40 Stancor 60P; '41 SX-28, '38 HQ-120	360
W8AQ	MOD	12
W8CZR	MOD	38
WD8OFB	'33 Hartley @ 2.5 W; '33 FB-7	12
K8UBL	'38 6F6 xtal @ 2.9 W; '38 HB 6J7-6F6	222
W9ET	MOD	153
WB9K	'33 Collins 150B @ 90 W; '37 HRO	357
W9POC	'38 6F6 xtal-6L6; '37 NC-100	486
N9TT	'35 BC-375; '37 BC-312	222
KC0CW	'39 6L6 xtal-809 @ 95 W; '35 HRO	1440
W0FXY	MOD	141
VE2SEI	'38 6L6-807 @ 35 W; '39 AR-77	297
VE3CLX	'41 6SK7 et al.-807; '41 HRO	909
VE3HIE/3	MOD	51

MEET THE COLLECTORS

Rodney Schrock, KD3OR
402 Lincoln St., Somerset, PA 15501

ARKAY A12 AMPLIFIER

In 1959, I was shopping for an amplifier to accompany a recently constructed Eico HFT-90 tuner. In a catalog from one of the wholesale houses - Concord, Poly-Paks, or Edlie - were advertised amplifier kits by Arkay, selling at low prices, perhaps to liquidate surplus stock.

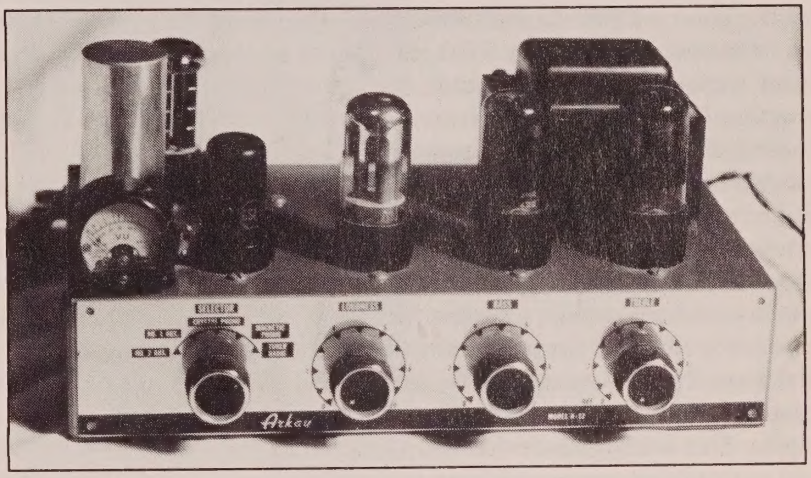
I don't recall much about Radio Kits, Inc., located in Richmond Hill, the one-time home of Grebe. They may have been popular in the New York City area and I think they made some TV and tuner kits.

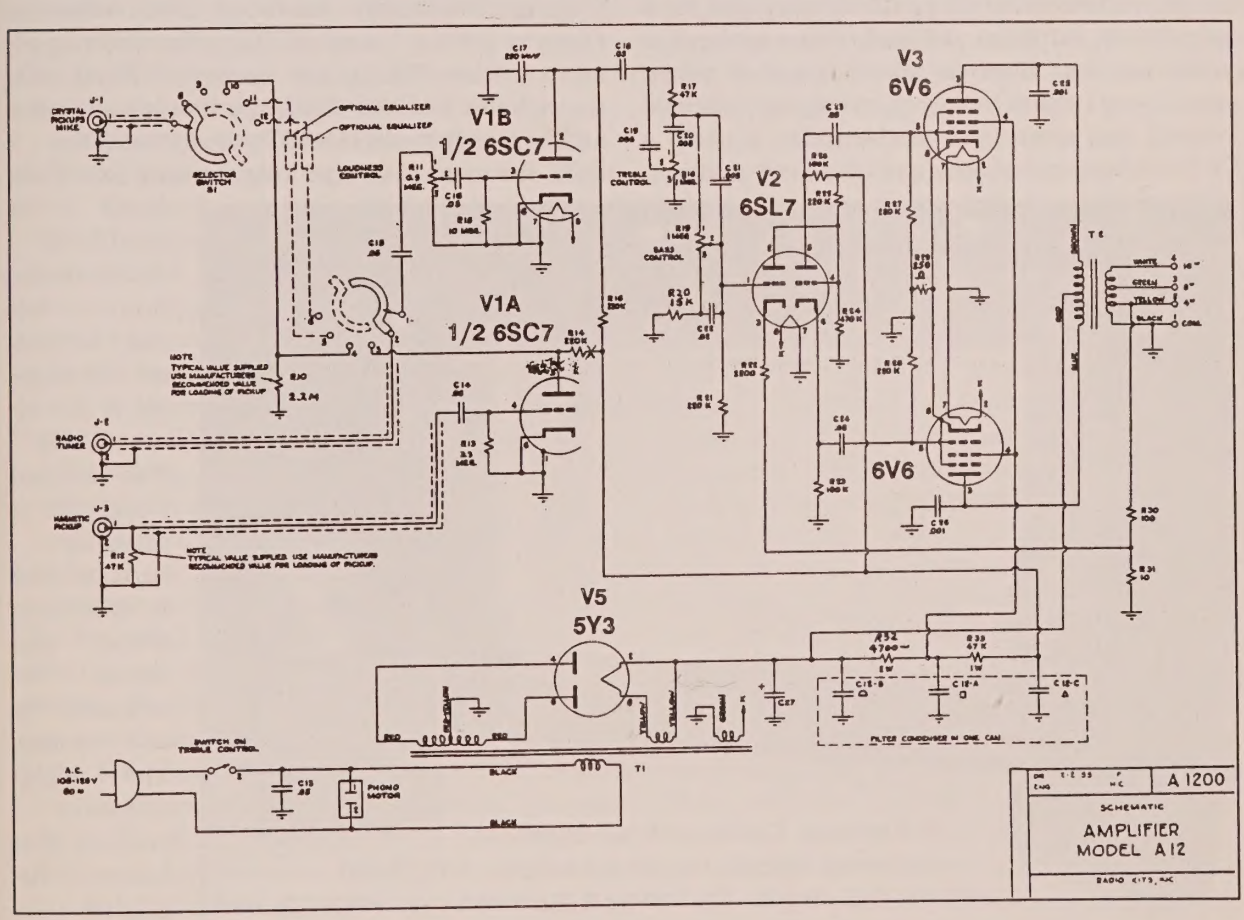
Without difficulty, I assembled the kit and the amplifier sounded great.

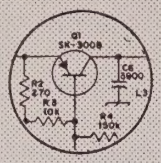
If we examine the schematic, we find a very conventional amplifier with 6SC7 input stages, 6SL7 phase inverter-driver, P-P 6V6 output with inverse feedback, and a 5Y3 rectifier.

Through the years, this amplifier has never given any trouble. It has all the original tubes but one. Never has a component failed. I did eliminate the V1A stage and changed V1B to a 6SF5 to reduce thermal noise; also I shortened, re-routed and re-grounded most of the shielded input cables to eliminate hum. The only addition was a Cal-Rad VU meter across the output.

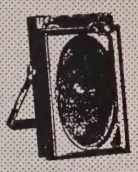
Different people have heard it and remarked how good it sounds.







TRANSISTORLAND



EDITED BY
Henry B. Cohen ("Mister Transistor")
2459 Eighth St., Fort Lee, NJ 07024
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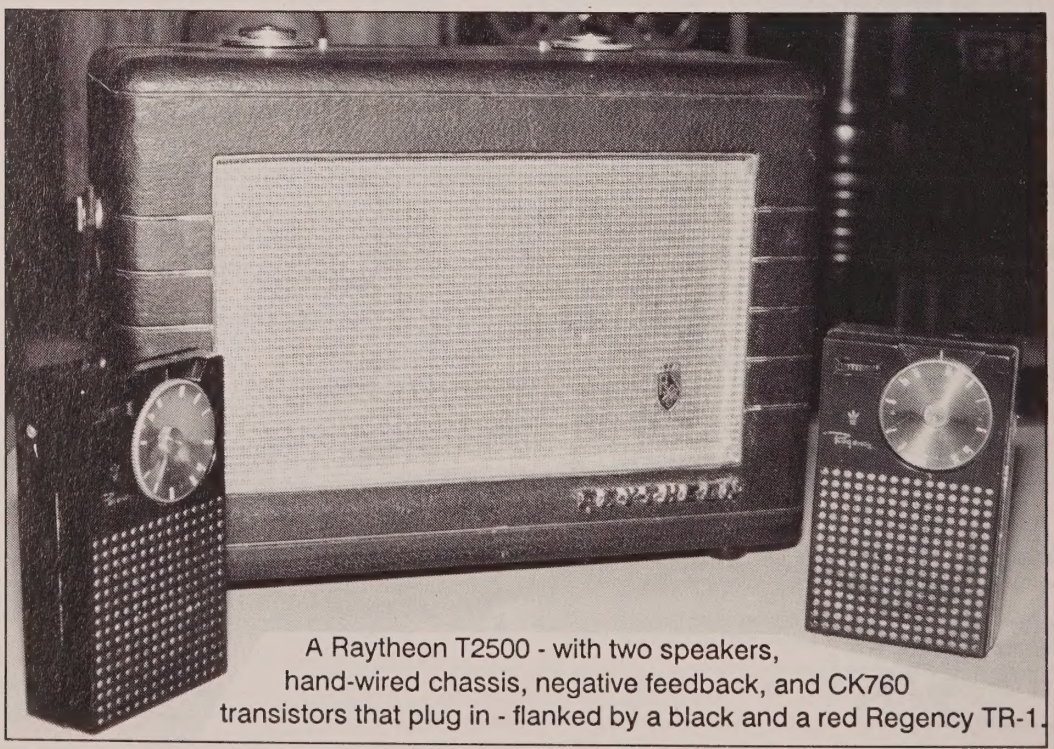
Last time around, I promised to write about "essential" collectible transistor radios. Being a shirt/coat-pocket aficionado, not a novelty maven, I can't speak with authority to the latter. If any readers are serious collectors of novelty sets, I invite you to contact and regale me with your expertise for inclusion in a future column.

CORE COLLECTIBLES

Of course, the Regency TR-1 is the most important radio a transistor collector can own. That's because the TR-1 was the first commercially available full-featured transistor radio. The set hit selected markets during the fourth quarter of 1954. I know that from the literature of the day and because I was given one for Christmas that year. As an aside, it was created primarily as a way for Texas Instruments to sell transistors (the parts, not the radios) to IBM for use in its computers. It was not because Regency wanted to be the first out of the gate with a transistor radio under its corporate belt. This solid-state device was living proof that TI's transistors were real, working, replacements for the vacuum tube. The set originally sold for a lofty $49.95, earphone and leather case optional at additional cost. It arrived in a choice of six colors: black, ivory (white), red, gray, mahogany (marbled brown), and green (also marbleized). It used a 22.5-volt battery and was (and is) a lousy performer. But again, it was the first and it reeks of mid-Fifties design influences and shortcomings.

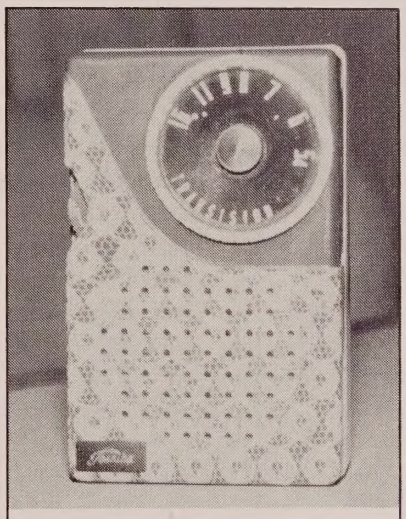
THE ROYALTY OF RADIOS

From this point forward, collectors will argue with me over my choices of core collectibles - so be it. I think that the most important radio of the time, beyond question, is the Zenith Royal 500. The original Royal 500 was a seven-transistor, versus the TR-1's four-transistor, design. It was made in two colors: burgundy and black. It cost a princely $75 sans earphone and case, but worked extremely well. In fact, I believe that this set proved transistors were here to stay. If the Regency was something of an experiment, the Royal 500 was definitely not. Unlike the TR-1, the set was not rushed into production within six months of inception. Released in June of 1955, hand-wired during its first year of production, the Royal 500 remains a superior piece of pocketable gear. Restored, the sets are powerhouses in terms of sensitivity, selectivity and push-pull audio output. In their "unbreakable" Nylon cases with brass trim, they are beautifully machined little treasures. Okay, ya got me, I love 'em. But after restoring almost a dozen TR-1s, and dozens of Royal 500s through the mid-'60s 500L, the line is impressive and is grossly undervalued by many collectors. I think the reason is simply that so many have been found in good-to-excellent condition - but don't be fooled. The supply is not inexhaustible. The original Royal 500 is relatively hard to find in mint condition and should be treasured by its owners. The eight-transistor versions that followed beginning in



A Raytheon T2500 - with two speakers, hand-wired chassis, negative feedback, and CK760 transistors that plug in - flanked by a black and a red Regency TR-1.

1957 with the 500D series are even better performers, but lack the history of the original. The pinnacle of all pocket sets was reached with the early '60s 500H, which featured a 3" x 5" loudspeaker with an off-center ceramic magnet structure. I've been told, and it seems reasonable, that the magnet was placed off-center to make the speaker a mechanical emulation of a true coaxial. The magnet structure was placed near one end and as such may help that portion of the cone better reproduce high frequencies. The rest of the cone, set much farther away from the voice coil, would handle the bass. This radio, and the cheaper, never-mentioned Royal 400 version, features 1/3 watt of audio output and can provide a very loud, rich sound from a cabinet virtually the same size as the original Royal 500 of seven years earlier. This extremely desirable set came in three flavors: black, two-tone gray, and white. The latter is extremely hard to find in perfect shape. Don't believe me? Then ask "Mr. 500H," Bill Jenkins, who has more of these than just about anybody else, having spent the last few years collecting them. If I could have only one transistor radio, it would be the 500H. And as a product line run over a ten-year period, the Royal 500s have no equal. But they were all expensive at their time of manufacture, save perhaps the $39.95 500L.



Toshiba 5TR193 "Lace" set.

WHY IT'S GREAT TO HAVE A TRIPLE-EIGHT

Enter the also highly collectible Emerson 888 series. Originally priced in the $45 range, the ca. 1956 Emerson 888 "No-name," so called because it preceded the almost identical Pioneer by about a year but without a specific model name on the set, was an instant marketing success. At its highly competitive price (an Emerson corporate mandate) and somewhat larger size than its arch-rival, the Royal 500, this eight-transistor receiver also delivered big sound through a large speaker and featured a broad range of cabinet colors. Later incarnations, also named after rockets of the time, included the Vanguard (my second factory-made transistor radio), followed a couple of years later by the Atlas and Explorer. The 888 name was used on two other models by Emerson in 1962, the Seattle World's Fair commemorative Galaxy and its stablemate the Titan. These latter products bore little resemblance to the earlier models save for the 888 logo on the faces of the sets. The most collectible of the series seem to be the Vanguards, Explorers, and No-name. The leather-cased Satellite and Transtimers have their appeal but, as with virtually all other transistor sets, the plastics are preferred. Hint to Emerson seekers: keep your eyes peeled for a relatively unknown model, the 849, which is believed to be the company's first coat-pocket sized transistor radio. This is a horizontal, hand-wired radio and one of the few sets produced in the color purple (grape). Emerson's 999s, smaller electric-shaver sized radios, are just about as rare. (The nines have nothing to do with the number of transistors [four] used in the sets.)

FROM TOKYO WITH LOVE

Sony was the first Japanese maker of transistors and consequently transistor radios. Its initial officially announced product, the incredibly rare and valuable TR-55, was marketed in August of 1955. Fewer than 1800 of the radios are thought to have been produced, and only two or three are known to be in collectors' hands at this time. This is by far the rarest collectible transistor radio in the world. Some of them are said to have been sold in Canada, and it is rumored that a few made it to our shores. Finding one, especially in mint condition, is analogous to winning the state lottery - *good luck!* Sony's TR-63 is the first shirt-pocket set made by the firm, which by late 1957 made its way to the U. S. A. This six-transistor radio is extremely valuable and a fair number have been found to date. I have restored and regretfully parted with two of them this past year. What is unique about the unit is that it set the pattern for most Japanese pocket transistor radios in terms of size, design and electronic configuration. Specifically, the chassis design and layout portend many of the later sets produced in Japan during the '50s-'70s. It was powered by the same-sized 9-volt battery as used today. Where many earlier radios revealed numerous compromises through a combination of miniature and full-sized parts, the TR-63 was completely miniaturized. And for a shirt-pocket set its performance belies its size. This is one neat and, in yellow-red, good-looking transistor radio.

The first Toshiba product (5TR-193), commonly called the "Lace," is another Japanese prize. Not only did this 1958 four-transistor reflex set (all right, some chasses used five transistors as the "5TR" indicates) out-perform most other four-transistor products, the front of the case was molded of transparent plastic and contained actual lace. Many collectors consider it the prettiest transistor radio ever made. Available in red or blue, the latter is far harder to find and hence more valuable.

I'll reveal more essential collectibles in future columns. For now I've given you a good idea of

what every collector should own: a TR-1, a few Royal 500s and 888s, a Sony TR-63 and a Toshiba "Lace."

PUTTY IN YOUR HANDS

About a year ago a friend and fellow transistor collector, Walter Bernd, appeared at my front door tightly holding a near-mint Zenith Royal 400. He swore that the radio had been mint when stored some years before, but examination of the upper left corner of the Nylon cabinet (where the two halves meet) revealed missing mate-rial in a saw-tooth pattern. Basically the set looked as though some clown had tried to pry it apart at the seams. Walter re-counted that this was not the first time he had seen such destruction in his Zenith collection. His opined that there was perhaps a chemical reaction between the Nylon case and the wax that helps seal the ferrite-bar antenna assembly. I knew that Walter couldn't be completely crazy; after all we're both former advertising executives and "Mad Ave." types are never nuts, right?

Fast-forward to a few months ago. At that time I got my hands on a pretty decent red Regency TR-4 in a Nylon cabinet. The only flaw was a slight inward distortion where the two halves meet on the bottom of the case. No matter, because the set displayed well and the anomaly was trivial. I attributed the condition to thermal causes. Perhaps the set might have spent some time on a warm radiator? That was until I opened the radio to begin restoration. *Shazam!* A cursory look revealed that a previous owner, for reasons unknown, had placed a piece of black plastic electrician's tape on the inside of the set. Perhaps to protect it from battery droppings, thought I. But the weird part was that the Nylon was soft and putty-like once I removed the vestiges of the tape. Okay, I know when something's amiss and so I phoned the "better things through chemistry" folks at Dupont. Who should know more about Nylon than its inventor, right? The fellow I spoke to offered no explanation. In fact, he said that nobody could get involved with answering my inquiry because the company had gone through a mass of layoffs and wouldn't spend the time researching the phenomenon unless duly compensated. So much for corporate America. What I have experienced, the chemical interaction of Nylon that turns it into putty, must be known to some among you and I would like to publish an explanation of the problem and a solution to it if there is one. For now, I suggest that all early Zenith collectors consider removing as much wax as possible from the antenna assembly where it nears the outer shell of the cabinet. Even the fumes (if indeed there are any) may be deleterious. In any event I expect that by publishing this information many radios can be saved from further deterioration. I am now a believer and have seen enough examples of the problem to know that not every saw-toothed anomaly in a Nylon cabinet is caused by an owner trying to part the halves with a coin, as once suspected.

(Continued from p. 29)

CLEANING BARE-ALUMINUM CASES

Many aircraft radios of WW II vintage have unpainted aluminum-alloy cases. Examples are the SCR-283 set, most of the SCR-274N gear, the AN/ARC-5 VHF models, and the AN/ARC-3 transceiver. These often carry a baked-on film of yellowish scuzz, perhaps from contaminants in the airplane or a later user who was a heavy smoker.

The filth is immune to removal by detergents. Abrasives and steel wool are "out" for removing it: we are trying to preserve the unburnished matte finish of the metal.

I originally had some success, on detached covers at least, by dipping them for a few minutes in a lye (NaOH) solution. The lye attacks both the dirt and the aluminum: the dirt floats off on a layer of bubbles, yielding a silvery matte finish close to the original appearance of the metal. The resulting etching process tends to even-out tiny scratches, reducing the damage from someone else's cleaning the case with steel wool.

However, this technique is clumsy and, involving lye solution in quantity, a bit dangerous. For complex work pieces like SCR-274N covers, the part must be placed in the solution so as not to trap the bubbles given off in the process. Otherwise a grayish deposit forms in the gas-trapping area, requiring retreatment.

A much more controllable method is to use lye-bearing oven cleaner ("Easy-Off"). This is a goo that, brushed onto the cover, gives the same result. Because the paste stays in place, it appears feasible to clean the chassis of, say, a BC-453 receiver as well as its cover.

Lye is vicious stuff, attacking hands and other body parts. "Read directions on the label" and wear eye protection. At the end, flush everything liberally with warm water to remove all traces of lye. A rinse in diluted vinegar, to neutralize any residual NaOH, wouldn't hurt. - LAS

REACTIVATING A WIRE BRUSH

A new wire brush gets pretty beat-up after a couple of years of shop use cleaning up old radio parts. However, most of the twisted and broken wires are located at the "business" end away from the handle. No problem: take a hacksaw and cut off the first couple of clusters of wires, and you have, in effect, a new brush. This can be done a couple of times before the brush gets too short to be useful. - LAS

KEY and TELEGRAPH

EDITED BY
Roger W. Reinke
5301 Neville Ct., Alexandria, VA 22310-1113
Please include SASE with correspondence.

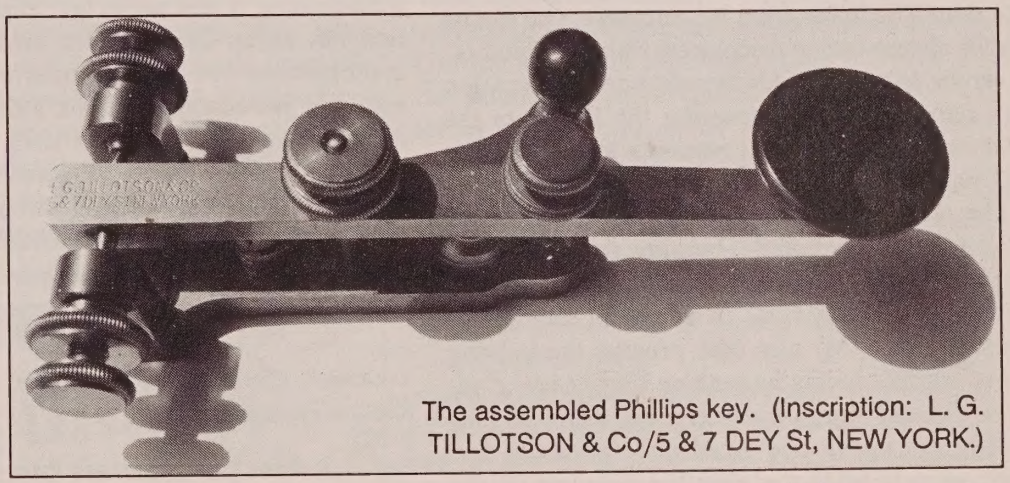
HAMMER MEETS ANVIL

A little more than a century ago, inventors of things telegraphic seemed to be obsessed with devising "new and improved" keys. While printers were being used on some major circuits, from a practical standpoint improving transmitting speed meant improving the hand key. More message traffic per shift meant more profit, some of which wound up in the wallets (or purses) of proficient operators. The favorite targets of the innovators were the lever pivots of keys and their contact arrangements, the latter in the hope of reducing the tendency of platinum contacts to momentarily weld together at high duty cycles.

Walter P. Phillips was to play a part in the development of semi-automatic keys, but not for another ten years or so. An aspiring operator whose first remarkable accomplishment (in 1868) was to copy 45.5 WPM from a "fast sender in Boston," he published in 1879 the first version of the brevity code which bore his name and which still sees occasional use. The code certainly contributed to message-handling efficiency, but Phillips was not satisfied.

We know now that the momentary "sticking" of the upper or lever contact (hammer) with the lower, base-mounted contact (anvil) could be mitigated by a condenser and resistor in series, but this was 1880. Platinum had been used for contact points since Morse's (Vail's?) first keys, according to Sabine. "The surfaces of the hammer and anvil of the contact were faced with platinum, in order to prevent oxidation by dampness from the atmosphere, or being burnt by the action of the current."

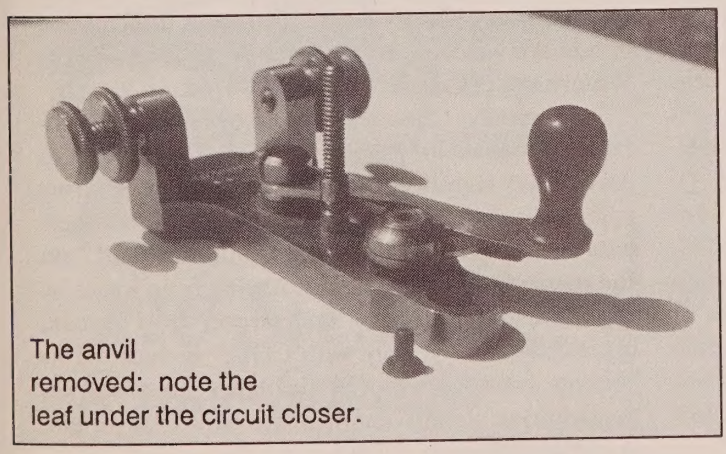
Lockwood described what happened when a lightning slinger warmed to his task. "This sticking is generally caused by [the] platinum contacts becoming gradually burned and made rough by the repeated action of the spark which appears every time the circuit is broken, or very small specks of metallic dust, which collect round the anvil and points. Sometimes it is occasioned by spongy or soft platinum having been used as the material for the contacts. This fuses to a certain degree every time the key is opened."



The assembled Phillips key. (Inscription: L. G. TILLOTSON & Co/5 & 7 DEY St, NEW YORK.)

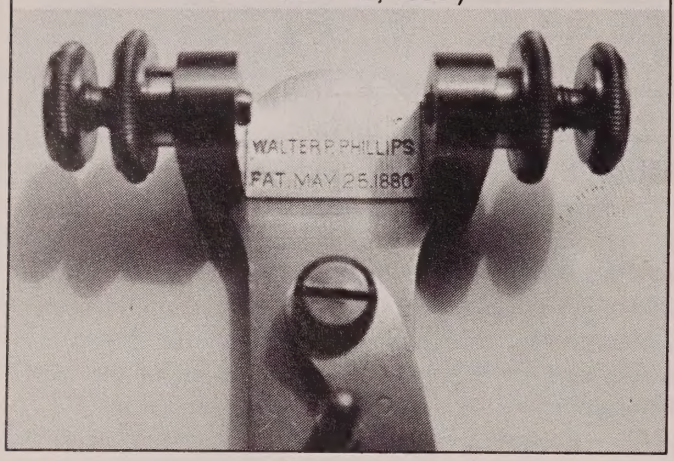
A sticky key will not only slow things down, but also will raise hell with an operator's wrist since lifting the lever is also required. Carpal tunnel syndrome has replaced "operator's paralysis," but it must have been as painful then as now. Cleaning the points helped if one had a small file or emery paper handy, but otherwise adjusting the key for more "play" (resulting in slower speed) was the only remedy. "Sideswipers" were supposed to prevent CTS, but apparently they were not popular among the operating fraternity.

Ordinary platinum had to go. Phillips thought steel was the answer, and on May 25, 1880, he was awarded a patent for a key featuring steel contacts. A



The anvil removed: note the leaf under the circuit closer.

Tillotson thought enough of the key to put Phillips' name on it. (Inscription: WALTER P. PHILLIPS/-PAT. MAY 25, 1880.)



marketing arrangement was made with L. G. Tillotson & Co., then the major telegraph-equipment supplier. Tillotson advertised the key with the advice that "The lower point is removable, and can be readily cleaned when discolored, while new points . . . can be substituted for the old ones, as occasion may require, without removing the key from the table or disturbing its adjustments in any manner whatsoever."

The operators of the 1880s probably found this to be rampant hyperbole, because there's no way one can get the anvil point out without moving the lever out of the way first. In his patent claim, Phillips wrote that "My aim is to prevent the burning of the contact points by making them easy of removal for the purpose of cleaning them, and by making the upper one small and the lower one large, so as to bring the electric sparks out on the bottom point, thus protecting the upper one almost wholly." Of course, other materials ranging from laminated platinum to tungsten to coin silver have found application in contact points since then, but they are almost always firmly fixed.

Phillips didn't stop with the contacts. Note that the lever pivot is at the extreme end, which, in the opinion of many oldtimers, has a negative effect on balance and feel. Also, note the spring-steel leaf riveted to and underneath the circuit-closing lever. When engaged, this lever securely grips the lip on the anvil - and that circuit is *closed*. Tillotson apparently offered only a legged model, with a choice of straight or curved lever. A box of six steel anvil replacement points cost a quarter.

In 1880, Phillips and Tillotson thought they had a key that would be enthusiastically accepted by discriminating operators. Testimonials from contemporaneous "practical experts" notwithstanding, it was not to be. Part of the explanation has to be the awkward anvil-point replacement process, but Jesse Bunnell was also a factor, with the introduction of his steel-lever key less than a year later. Then, in 1882, as Bunnell was cornering the key market, Tillotson effectively buried the Phillips key with his strong promotion of the "Victor" key with its innovative trunnion arrangement. In 1993, Phillips' brevity code, not his key, serves to perpetuate his name.

REFERENCES

Lockwood, Thomas D., Electricity, Magnetism and Electric Telegraphy (New York: D. Van Nostrand, 1883), p. 225.

Sabine, Robert, The History and Progress of the Electric Telegraph (New York: D. Van Nostrand, 1869), p. 49.

Phillips, W. P., of Washington, D. C., Letters Patent No. 228,111 dated May 25, 1880.

"ANGRY-NINE" ASSOCIATION

Louis Meulstee, PA0PCR, reports the recent formation of the International Angry-Nine Association, a European radio club devoted to preserving and operating military radios now numbering over 85 members. The club's name derives from the popularity of the AN/GRC-9 AM-CW field radio and its European- (and Chinese-) made variants. It operates an AM network every Sunday at 10 AM Dutch time on 3705 kHz. The club was written up in the Radio Society of Great Britain bulletin *Radio Communication* for April. The Association publishes a Dutch-language magazine, *Q-Five*, with plans for an English version. Net control station is PA2*GRC* (PO Box 3170, NL-3502, Utrecht, Holland). One of the network participants uses a complete SCR-399 set (of WW II fame), in its truck shelter placed in his garden. There is no claim, however, that GRC-9 users are powering their stations from the original hand-cranked generator!

THE BC-RC-SCR PROBLEM

Military researcher Frederick Chesson, author of the list of Signal Corps BC-, RC- and SCR-numbered equipments in AWA Review Vol. 6, is seeking aid in filling gaps in the index. As published, it occupies 43 pages, yet it was impossible to correct all gaps and errors in the source material. Military-history enthusiasts with information to add are welcome to contact him at 144 Fiske St., Waterbury, CT 06710, (203) 754-4764.

Incidentally, Chesson's listing of military manufacturer codes in Review Vol. 7 claims only to cover Navy suppliers, but in reality includes Army sources as well. Thus a BC-348R receiver, otherwise unidentified as to maker but with "CDL" on the nameplate, is revealed as having been made by Belmont. An AN/PPN-2 paratroop drop beacon, cryptically labeled only with"CGG," is decoded as coming from Galvin (Motorola) - and internal construction details confirm the Motorola origin. A useful reference. - LAS

THE LOUDSPEAKER

EDITED BY
FLOYD PAUL, W6THU
1545 Raymond, Glendale, California 91201
All correspondence requires SASE for reply

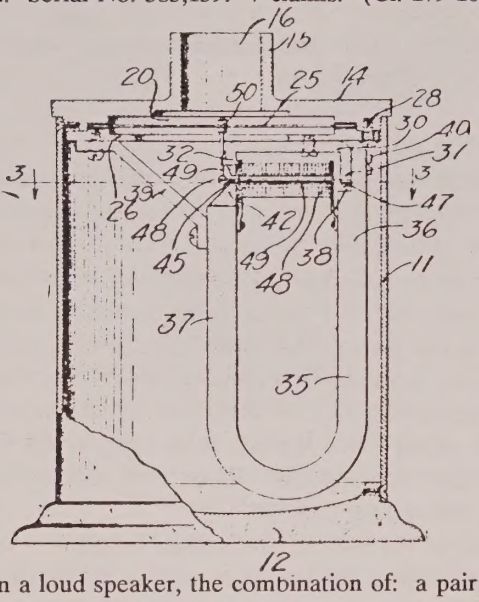
THE STENTORPHONE CO.

The Stentorphone Company of Los Angeles went into business in mid-1923 to produce horns and horn drivers. The company acquired a horn-driver patent No. 1,560,925 from Delmar A. Whitson by *mesne* assignment. Delmar's horn speaker design appeared in an April 1923 issue of *Radio Journal*, a magazine published in Los Angeles. The horn itself appeared similar in design to the Western Electric 518W model, in both silhouette and size. Delmar's driver design appears similar to the Baldwin earphone mechanism and perhaps there was some patent infringement. Mr. Whitson's straight neck and bell were made from die-cast wood. By December of 1923 Stentorphone (spelling changed to Stentorfone shortly afterward) was promoting both a vertically standing wood-pulp straight-neck speaker and a driver which was sold separately. The horn may not have sold well and by April of 1924 the company was advertising a horn with a "C" neck and bell mounted on a uniquely designed stair-stepped base. Three more full-page ads in *Radio Journal* later in 1924 and in 1925 seemed to promote sales of drivers, not horns. A November 1924 full-page ad mentions a cabinet-type horn which contained a "California Nightingale Unitype" driver for $29.50, but no picture was shown. Also mentioned in this issue was an upgraded driver unit called Master Type, offered for $18.80.

Much to his delight, the author found a base and Unitype driver for the Stentorfone "C" neck horn this January, in an antique store in Carlsbad, California. The photo of the author's horn shows a replica neck and bell attached to the base. The neck and bell unit is a Dictogrand assembly which best duplicates the neck and bell shown by sketch in the Stentorfone April 1924 ad, which also uses "Nightingale" to describe the tone quality coming from the driver. The stair-step base is certainly a one-of-a-kind design. The base is wood and its shape is a partial pyramid. It appears to be an easily made design and one wonders why these have not shown up in local swap meets. Perhaps the drivers sold reasonably well and the horn did not. The driver was priced at $10 and the horn with driver at $22.50.

1993 rediscovery of the "Super-Speaker."

1,560,925. LOUD SPEAKER. DELMAR A. WHITSON, Los Angeles, Calif., assignor, by mesne assignments, to Stentorphone Company, Los Angeles, Calif., a Corporation of California. Filed Aug. 30, 1922. Serial No. 585,159. 7 claims. (Cl. 179-108.)



1. In a loud speaker, the combination of: a pair of depending magnets placed in substantially the same vertical plane and with the positive pole of each magnet adjacent to the negative pole of the other magnet, a positive pole of one of said magnets being directly in contact with a negative pole of the other of said magnets; an armature having one secured to one of said magnets and the other end thereof extending between the negative pole of one of said magnets and the positive pole of the other of said magnets; an exciting coil surrounding said armature for creating a flow of magnetic flux therein having a density corresponding to the strength of current flowing through said coil; a diaphragm; a shell surrounding said magnets; link means for imparting the movement of said armature to said diaphragm; and means for supporting said diaphragm horizontally at the top of said shell.

The Jaw-Breaking Philomel

Nobody longer calls the world's sweetest bird singer a *Philomel*.

American simplicity demands a better name—a descriptive name, a name with romance, whose syllables are melodious and suggestive of the nightly notes that gladden hearts of lovers as they stroll the winding paths of moonlit gardens. But NIGHTINGALE! Ah! That's the name. How it instinctively suggest loveliness—a night, a scene, a time, a certain tone which breaks into liquid melody and fades away softly and dies only to recur again in the full loveliness of *melody from the skies*.

So in the Stentor—California Nightingale Unit you have a loud speaker descriptive of the lovely instrument it is—Stentor for volume and Nightingale for melody. It is an instrument that will charm your household.
Ask to hear the Nightingale Stentor, "The Name You Cannot Forget."

California Nightingale Super Stentor, Complete	**$22.50**
California Nightingale Unitype, which is unit only	**10.00**
Rubber Adaptor for Phonograph Attachment	**.50**

The STENTORFONE *Company*

784 Ceres Avenue Phone VAndike 7040 Los Angeles, Calif.

1993 FALL CLASSIC RADIO EXCHANGE

Sept. 26-27, 2000 UTC Sunday to 0400 UTC Monday. The Classic Exchange, "CX," celebrates the commercial and homebrew equipment that was the pride of our ham shacks a few decades ago. Object is to restore, operate and enjoy older equipment with like-minded amateurs. A Classic Radio is at least ten years old, an advantage but *not* required to operate CX. You can use anything, although new gear is a distinct scoring liability and less fun!

Exchange your name, RST, QTH, receiver and transmitter type (homebrew, send final-amp tube or transistor) and other interesting conversation. The same station may be worked with different equipment combinations on each band and each mode. On CW call "CQ CX," on phone call "CQ Classic Exchange." Non-participants may be worked for credit. Suggested frequencies: CW up 60 kHz from low band edges; phone 3880, 7290, 14280, 21380, 28320; Novice/Tech 20 kHz up from low band edges. 7060 and 3560 tend to be the most popular CX freqs.

Scoring: multiply total QSOs (all bands and modes) by the following sum: [total number of different receivers and transmitters worked on each band and mode + total number of states/provinces/countries worked on each band and mode]. Multiply that total by your Classic Multiplier: the total years old of all receivers and transmitters used, three QSOs minimum per unit to qualify. If equipment is a transceiver, multiply age by two. If homebrew, count as 25 years old unless actual construction date or design is older.

Certificates are awarded every now and then for highest score, exotic equipment, best excuse, etc. Send logs, anecdotes, pictures to: Jim Hanlon, W8KGI/5, PO Box 581, Sandia Park, NM 87047; or Marty Reynolds, AA4RM, PO Box 13354, Atlanta, GA 30324. Include SASE for the next *CX Newsletter*. (Stu Stephens, K8SJ)

BUILDING SMALL RADIO RECEIVERS

David Dameron
819 Boundary Place, Manhattan Beach, CA 90266-6621

For the last two years I have enjoyed building various AM and SW radios, from crystal sets on up. One book which I've enjoyed looking and reading through is Radio for the Millions, originally published by *Popular Science* in 1945, now sold as a paperback reprint. Now I look through ham swapmeets for variable capacitors (condensers!), RF coils, tubes, output transformers, etc.

Usually I build six-volt sets which run from a separate power supply connected by three wires: ground, 6.3 VAC and +150 VDC. This uses one power supply with many sets, avoiding duplication and saving power-transformer costs. I use a silicon rectifier in the power supply, letting it run cooler and longer, but causing some hum problems, covered below. The radio itself is all-tube.

One circuit which I've been pleased with is a two-tube regenerative using screen-grid control. I wanted to build a radio to meet the following requirements: ▪ Speaker output; ▪ Using only a short antenna; ▪ Speaker and power supply included; ▪ Small, simple circuit.

For these features, I picked AC-DC operation. However, the circuit can be used with many families of tubes. For example, starting with newer tubes and going back, the following could be used:

12AU6 & 50C5 - Miniature AC-DC.
6AU6 & 6AQ5* - Miniature, 6-V heaters.
12SJ7 & 50L6* - Octal AC-DC described here.
6SJ7 & 6V6* - Octal 6-V (also 6J7, 6F6).
6C6 & 43, 25Z5 rectifier - Large-base AC-DC in Radio for the Millions. The heater dropping resistor gets hot with 0.3-A tubes!
1N5 & 1C5* - 1.4-V battery tubes.
32 & 33 - 2.0-V battery tubes.
57 & 2A5 - Later 2.5-V types.
24A & 47 - Early 2.5-V tubes

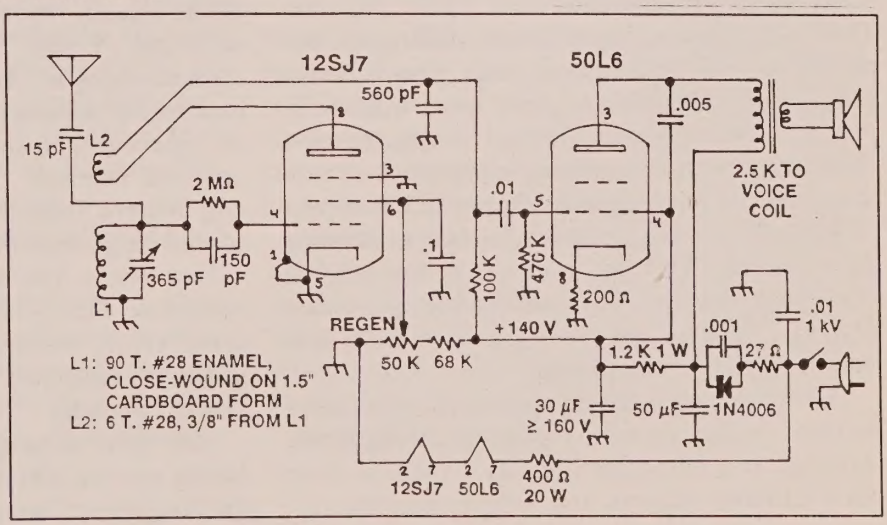
It would be fun to build and compare all of them. So far I've constructed the sets marked with a *.

SILICON RECTIFIERS AND HUM

One problem I have found with silicon power rectifiers is excessive hum, especially in regenerative sets. The silicon rectifier has a much lower impedance than a tube rectifier, so that the B+ current flows in much larger and shorter spikes at the peaks of the AC line voltage. This current flow produces much more harmonic energy and a harsher hum. A resistor in series (27 Ω) cuts the peak current and reduces the harmonics. A second source of trouble is hum modulation where RF carrier energy from the regenerative detector gets to the rectifier, which is being switched on and off by the AC power line voltage. The RF and AC voltages are mixed, producing 60-Hz- and harmonic-modulated RF signals which are picked up again by the detector. This hum is heard only with a station tuned in. The problem is helped by RF filtering - a 0.001-μF disk capacitor in parallel with the rectifier.

CONSTRUCTION AND USE

The radio uses a 12SJ7 regenerative detector and 50L6 output. It is built on a 3 x 5 inch aluminum plate with the tubes and antenna coil on top. This way it glows in the dark! The plate is the top of a three-inch wooden box with a miniature speaker built in on one side. The controls on the front are the variable tuning capacitor and the regeneration control, used also as volume, with AC switch. I have found that using screen regenerative control with a pentode works well, gives high gain, and gives adequate volume control. The top plate is not used as a chassis connection to avoid shock hazard. The antenna is a six-foot length of wire, which is no more trouble than the AC line cord. The radio works well on local stations. A longer or outside antenna could be used to pick up weak stations, but the antenna coupling capacitor might have to be reduced to prevent the antenna impedance from loading the antenna coil and reducing the selectivity. Do not use a ground wire with this or other AC-DC sets! Please use a polarized plug so the common is connected to the AC neutral. This connection can be checked with a AC voltmeter or neon voltage tester. For those who want to build or have built similar sets, I welcome any comments.



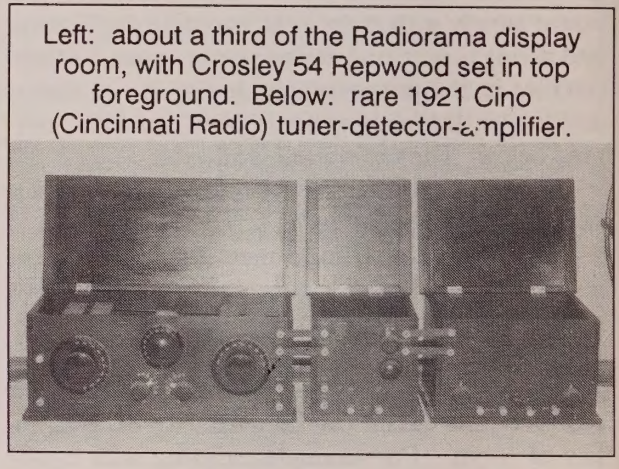
MEET REPORT - MIDWEST RADIORAMA

The first Midwest Radiorama, sponsored by SPARK (Society for Preservation of Antique Radio Knowledge) and MSARC (Mid-South Antique Radio Collectors), survived a late shower on Friday, June 25, and proved a success. The parking lot of the Budgetel Inn in Springdale, Ohio, a northern suburb of Cincinnati, was crowded with 45 vendors from as far away as Florida and California. Hourly door prizes drew 158 registrants.

The tours on Saturday proved to be popular, with 21 interested parties touring the Jack Gray Wireless Museum at the WCET public-television studios downtown. The WLW transmitter site and the Voice of America transmitters and antenna array at Mason hosted 26 visitors.

Most attenders felt the highlight of the Radiorama was the display of equipment from Kentucky, Ohio, and Indiana manufacturers. Peter Palm of Cincinnati did an excellent job of assembling the radios. Sets were represented, along with literature and advertising media, from such companies as Arvin, Belnap, Cino, Crosley, Day-Fan, Doron Bros., Fairbanks-Morse, Franklin, General, GM, Harbison-Gaithright, Higee-Avrey, Kingston, Kodel, Midwest, Nightingale, Steinite, and Wilson. A fine collection of equipment was enjoyed by all.

Mark your calendars now for June '94! (Bob Sands, Radiorama Chairman)



Left: about a third of the Radiorama display room, with Crosley 54 Repwood set in top foreground. Below: rare 1921 Cino (Cincinnati Radio) tuner-detector-amplifier.

MEET REPORT - ARCA 1993

The 1993 meet of the Antique Radio Club of America was held June 10-12 in Huntington, WV. It included the usual program features (equipment contest, flea market, etc.), but there were two outstanding items on the agenda that I thought contributed to a great success.

First was the Museum of Radio and Technology. The West Virginia chapter of ARCA acquired an old school building not too long ago, returned it to good condition, and outfitted it with a fine display of antique radios owned by the chapter or loaned by members. This is as large a building as I've seen exclusively devoted to a radio museum. There are about a dozen former classrooms displaying various topic areas in radio. One is outfitted as a radio service and parts store, with a display of "new" early sets. There is a library and a room filled with transmitting equipment. There are numerous teaching aids. One is an FM receiver with all its parts mounted on boards showing the schematic. This "set" is almost 20 feet long. It is installed atop the classroom blackboard - and is playing! Other rooms present artifacts from each decade up to the near-present.

The museum also has an auditorium with 300 or so seats. Videos on radio topics were being shown. Adjacent is a full kitchen facility. There is room for a lot more artifacts, and, judging from the rapid progress made in setting up displays for this meet, I'm sure that even more will be in place on the next visit. The site is 1640 Florence Ave., Huntington, WV 25701, (304) 525-8890. Hours are 10 AM - 4 PM Fri.-Sat., and 1-4 PM Sunday.

The other highlight of this meet was the banquet program. The speaker was Larry Anderson, station manager of WWVA. With him was James Duffield, who made quick changes to depict the best known individuals in radio history, including Armstrong, de Forest, Edison, Fessenden, and Marconi. Not only did he emulate these individuals, he actually repeated many of their experiments on stage! I saw "Edison" talk into a manually cranked recorder, make a recording, and play it back to the audience! I also saw "Hertz" perform his experiment to show that radio waves could be sent and received. When Duffield removed the ring antenna from the RF field, we could see the spark extinguish at the receiver. Great stuff!

Next year's ARCA meet will be in Little Rock, Arkansas. This is farther southwest than any previous ARCA event, and will give an entirely new group of collectors the opportunity to attend. (Larry Babcock)

The writer is being too modest about the event, having won the ARCA Houck Award for his entry in the Equipment Contest! - Ed.

THE MAILBAG

Readers' comments on early radio topics are welcome. Because of space limitations, letters that are published may have to be edited. Send all material to the Editor.

ARC TRANSMITTERS

I became acquainted with the AWA only recently, and thoroughly enjoyed reading [Review] Volume 7, especially W. J. Byron's article on the arc transmitter. My first acquaintance with wireless was a visit to the Navy's station here in Arlington and the impression of a boiler of some sort. Later I obtained a de Forest crystal detector and a pair of headphones, and was hooked on a future in radio from then on. Later my sidekick and I visited the station in the main post office on Pennsylvania Avenue where they had a Federal arc transmitter and Wireless Specialty [Apparatus] Co. three-tube receiver which was used for weather collection for the then-infant air mail service between here and New York. This visit led to later employment with the Airways Division of the Bureau of Light Houses which later became the FAA. I retired in 1971.

Harry H. Olmsted

TB SIG-5: JAMMER GIBBERISH

A closer look at the [Technical Bulletin] SIG-5 descriptions of the AN/CRT-2 and AN/PRT-1 radio jammers [May *OTB*, p. 28] reveals additional examples of Official Inconsistency: note that the first word in the parentheses is "expendable," presumably meaning "drop-it-and-forget-it." However, each description is followed by the boldface letters NX, which means "Non-Expendable." In other words, somebody is going to be responsible for Uncle Sam's throw-away electronic goodies!

One can possibly conceive of the Rangers or paratroopers gathering up their now-silent PRT-1s from diverse places of concealment, hopefully now safe behind the front lines. But the idea of our troops having to scour the countryside for widely scattered CRT-2s is another matter, indeed!

And who knows how many now-famous Siemens or Telefunken engineers got launched on electronics careers when, as boys, a sputtering CRT-2 arrived quite unannounced in their family farmyard . . . or through a bedroom ceiling?! Of course, most CRT-2s were probably regarded as delayed-action bombs by the authorities and treated as enemies of the Third Reich, thereby ruining perfectly good spark transmitters!

As to more serious SIG-5 inconsistencies, there is the matter of equipment classification, typified by certain pages wherein the equipment cataloged was so sensitive that "Further description classified higher than Restricted" (SIG-5's own classification). This would imply the item in question was either CONFIDENTIAL or SECRET, or perhaps even TOP SECRET. In many cases, however, the listing would be followed by that of an up-graded model, completely described down to the last nut and bolt.

Likewise, I have discovered sub-components, like modulators, control boxes and even receivers or transmitters, whose functions and associated units were well described as to their associations with the over-all device. Even catalogings of small parts and hardware often listed in detail the parent item. I present the following fictitious description, which is still a true representation of actual items I have scanned over in the volumes comprising the awesome SIG-5.

> 2C3699/P2 PLATE, mounting: (detailed physical description, including hole sizes, plating and finishes) Used with Range Calibrator BC-1492, P/O Airborne X-Band Surveillance Radar SCR-888.

Whereupon, turning to the two parent items, we find even their basic descriptions cloaked by "Classified Higher Than Restricted" labels.

In closing, you mention [the fact of these jammers covering the 160-, 80-, and 40-meter amateur bands, if not the Citizens' Band]. Well, there were plenty of airborne jammers that *did* cover 27 MHz, including a number that made it to the surplus market, too! Examples:

RT-45/ARQ-1, 14-50 MHz (code name "Sandy")
T-34/ART-7, 27-34 MHz
T-44/ARQ-9, 18-34 MHz, 25 W
T-56/ART-2, 21-50 MHz (code name "Pad")

Now, if there are any obnoxious ops on 2 meters ("repeater rats," perhaps?) the T-28/APT-1 100-210 MHz, 30-W jammer (code name "Dina") would fix them good . . . as well as the upper-band TV channels, too!

Oh, yes, 1943 is the 50th "AN-niversary" of the Army-Navy Electronic Equipment Classification System. Exactly when it was initiated is not clear, and some Signal Corps and (especially) Navy equipment continued to appear under the old terminology to the end of the war. Perhaps this is gist for a future *OTB* or AWA Review article.

Anyway, I would like to have an insertion in the *OTB* requesting info on the *last* BC-, RC-, and SCR- equipments. The last known items are: BC-1421, RC-384, SCR-838. Indeed, there is a substantial gap from SCR-800 to 838 . . .! [See p. 48 for more details, including address.]]

Frederick W. Chesson

CLASSIFIED ADS

Old-time ads are free to members collecting and restoring equipment for personal use. **The rules:** (1) one ad per issue per member; (2) include an SASE if acknowledgement is desired; (3) material must be over 25 yeats old and related to electronic communication; (4) give your full name, address, and ZIP code; (5) repeats require another notice - we aren't set up to repeat automatically; (6) the Association is not responsible for **any** transaction; (7) we retain the right to reduce the size of the ad to fit space; (8) AWA does not accept commercial advertising; (9) deadline for ads in the November issue is September 4; those received later will be held for the following issue. Mail **all** ads to: **Richatd Ransley, Box 41, Sodus, NY 14551.**

SELL/TRADE - BC/SW TUBE RADIOS

Majestic #72 cabinet w/doors, $75; Bosch #58, $75; Zenith 10S669, $75; Zenith 8G005 VT, $75; Zenith H500, $75; Crosley battery Fiver, $55; Hallicrafters S-38B, $55; Motorola #56 WIB,$45; GE 115W; $45; Zenith C724l, $75; Mantola R664 PV, needs work, $25. All sets wkg. except as noted. UPS extra. Robert Rossi, 10936 Melbourne, Allen Park, MI 48101.

AK 37 $55; Andrea VK12 TV, $75; old books and ham magazines, audio equipment. Send LSASE for list. Tim Martin, Shaker Heights, Rt. 49, Pittsfield, MA 01201, (518) 794-7435 eves/weekends.

Silvertone 6356 wood table dry-battery radio. Needs dial glass and knob. $12.50 plus 10 lb. UPS. John Uscinowski, RR #1 Box 379, Greenwich, NY 12834-9519.

English radios, 1931 Ekco SH25, Radio, Radio, p. 121; 1945-46 Murphy A98, p. 172 R. R.. Both are large Bakelite sets in exc. restorable cond. $1500 each. Ron Maseda, 84 Lynx Drive, Hanover, PA 17331, (717) 632-4378.

1923 Radiola V, $449; 1925 Atwater Kent 20, $145; 1925 American Radio, Super 5 Arc-Lininger, $145. All complete, untested, plus shipping. Send $1 and SASE for photos. John Dudley, Rt. 1, Box 576, Hood, VA 22723, (703) 948-6290.

Pilot Super-Wasp with separate AC supply, $600 OBO; Philco 39-71, nice tweed case, &75; Ever-Ready #2 w/speaker, $200; Packard-Bell 65-A, lovely maple table radio, $200; Hallicrafters S-72R portable, $125; all plus UPS - happy collecting! Chuck Bray, 1322 Ivy Rd., Bremerton, WA 98310, (206) 373-1013.

Have just acquired a small collection of antique radios, some 1920s battery sets and some 1930s AC sets. Please send an SASE for copy of list. Bill Hurni, W3HWT, 329 Evergreen Dr., North Wales, PA 19454.

SELL/TRADE - COMM GEAR

Gonset Communicator IV transceiver for 220 MHz; AN/APQ-2 radar transmitter. Both new in boxes with manuals. Latter uses interesting #47 dial-bulb setup for modulator. ATV possibilities. Best offers. Dave Smith, K9UIM, Box 81, Olney, IL 62450, (618) 392-6601.

National NC-300. Last call: if not sold or traded will part it out. Write for info. Rex Byle, WA9JWT, 3312 W. Vera Ave., Milwaukee, WI 53209-2519.

Harvey-Wells TBS-50 Bandmaster Deluxe and power supply; all tubes. Frank M. Dukat, 573 Pinecrest Dr., Los Altos, CA 94024-7147, (415) 961-0478.

Hammarlund HQ-180 front-panel assembly. Professionally painted and new silk-screen. Assembly incl. panel, edge extrusion, dial escutcheon and Hammarlund logo, $100. Ron Eisenbrey, 115 First St., Sugarland, TX 77478-3003, (713) 646-7302.

Trade low-freq RCA receiver AT-8510 w/power supply and manual. Looking for a Hammarlund HW-120 or HQ-129. Fred Ritter, W4FI, 930 First Place, Longwood, FL 32750, (407) 339-5727.

SELL/TRADE - GENERAL

Tubes, schematics, Rider's Manuals, etc. LSASE for price list. Sam Faust, P. O. Box 94, Changewater, NJ 07831.

Commercial power supply for battery set $40; 10 good 201A tubes, $40 or best offer. Baldwin C, K & L, Signal Corps R-14 headsets; 2 early variocouplers, 2 early variable condensers. Wendell Trumbull, 54 E. Market St., Bethlehem, PA 18018, (215) 867-6662.

SELL/TRADE - LITERATURE

Memorabilia: the *VHF News* by Bill McNatt, W9NFK, of Franklin Park, IL. 45 issues, Vol. 1 No. 5 to Vol. 5, No. 2., $15 shipped. J. Lisaius, 116 Or-

ton Rd., W. Caldwell, NJ 07006, (201) 226-7943.

Collection of books, magazines and catalogues relating to old radio, TV, SW, broadcasting, hi-fi and service. Many radio repair manuals. SASE for large list. Bill Rolf, 30131 Center Ridge, Westlake, OH 44145, (216) 871-4547.

Matty's The Illustrated History of Phonograph, full-color out-of-print reference. Only 3 left, 4 lbs, mint, orig. price $65, or trade up/down for good cond. Arvin Mighty-Mite. Jimmy Ka Keung Chan, 1265 Kendall Dr., #3521, San Bernardino, CA 92407.

Fine Tuning's *Proceedings*, four books: 1988, 89, 91, 92-93, $25 postpaid for all four. Ken Greenberg, 4858 Lee, Skokie, IL 60077, (708) 679-8641.

Large 1959 book, Fundamentals of Single Sideband by Collins Radio Co., $17. Milt Stanley, 813 Oakwood Road, E. Peoria, IL 61611, (309) 699-6701.

Back issues of *OTB*, Vol 16, No. 4 thru Vol 33, No. 4. 69 copies, $60 plus postage. Back issues of *A. R. C.*, Feb. 1985 thru Dec. 1992, 95 copies $47 plus postage. Herman Fothe, 10 Jackson St., Sloatsburg, NY 10974, (914) 753-2090.

Raytheon sub-min tubes, 4th ed. catalog plus later (1955-56) catalog data on 542DX, 526AX, 5672, 6418, 6419, 6519. 142-page reprint, $25 PPD. Sylvania sub-min tubes, 1952 catalog, 10-page reprint $5 PPD; Hickok sig gen 277, 277X, 288X, 38-page reprint $12 PPD. Gary Micanek, 226 Henry Ave., Manchester, MO 63011.

SELL/TRADE - MILITARY

WW II British Bomber Command receiver R-1155E, unaltered, orig. cond., $650. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286, (216) 659-3244 before 8:30 PM EDT.

SELL/TRADE - PARTS

Small quantity of Bud 5-pin and B&W BVL 1500 series and 3400 series coils and bases. Also some B&W coils from 10-kW amplifier AN/MRC-2 (look like giant BC-610 coils); extra BC-610 coils and tuning units (none for 160 meters). LSASE for list. Robert Downs, WA5CAB, 2027 Mapleton Drive, Houston, TX 77043-2410.

Coils: 4 honeycomb and 3 Giblin-Remler, with plugs, $30 for all. Webster Electric wood variometer, $20 plus postage. Charles Closson, 1290 Glenwood Ave., San Jose, CA 95125 (408) 294-4702.

Coils - set of four SW plug-ins: red, blank, brown, green. Six prongs, three windings each. Manufacturer unknown. AB moldmark visible inside one coil. $25 incl. shipping. David C. Ivarson, 5 Church Road, Collegeville, PA 19426.

WM Wireless 1/2 kW spark transformer, about 1905. $250 OBO. Bill Reass, 1911 Manzana, Los Alamos, NM 87544, (505) 662-2790.

SELL/TRADE - TEST GEAR

General Radio 759A sound-level meter. Purchased from Millen Co. assets. Suspect it's from 1940s. $85 plus shipping. Floyd A. Paul, 1545 Raymond Ave., Glendale, CA 91201, (818) 242-8961.

Sencore VB2 Vibra-daptor. Test 3-and 4-prong, 6/12-V vibrators. Plugs into any tube tester. $8 postpaid. Ken Greenberg, 4858 Lee, Skokie, IL 60077, (708) 679-8641.

SELL/TRADE - TRANSISTOR SETS

Magnavox All-Wave AW-100, $25. Michael Morrell, Rt 2, Box 5024, Williston, FL 32696.

Raytheon 8TP1, wkg. - the world's second transistor radio (early 1955) and the first one to sound good. Photo on p. 187 of The Portable Radio in American Life. Michael Schiffer, 2718 E. 10th St., Tucson, AZ 85716, (602) 325-3532.

Zenith Royal 500 Deluxe, 1956. 7-transistor size in burgundy nylon case. Exc. wkg. cond.. Incl. unused leather case and earpiece. $150. L. Friedman, 578 Alpha Road, Grahamsville, NY 12740, (914) 985-7765.

SELL/TRADE - TUBES

Tubes - Australian version (balloon envelope with pip) of early Western Electric 101D and 104D. Made by Standard Telephones and Cables - type SY-4101D and SY-4104D, new in boxes. US $25 plus P&P (US $10 for 1-3 tubes). Ron Langhans, 82 Bass Dr., Baulkham Hills, NSW 2153, Australia, phone 61-2-674 2846.

Large stock NOS tubes. Military, industrial, US, foreign, rcvg, xmtg, new and used. Many parts and xfmrs for early TV and radio. Want AK radios, parts for AK radios, AK literature; Rider's Vols. 1 to 5, 6032 & 6032A IR converter tubes. Bill Williams, PO Box 63, Regina, KY 41559.

Hundreds of WW II "Dockette" radio tube adapters for many replacement combinations or as collector items, $2. ea. plus mailing or make an offer for all. Charles D. Newcomer, 100 Central Manor Rd., Mountville, PA 17554.

De Forest tubular "Audion Detector," Cunningham tubular Audiotrons, Moorhead Audion (VT-type), Moorhead Electron Relay, Myers Valve, GE UV-200, WE VT-2, Taylor 866 Jr (NIB), RCA 866A. All used unless noted, most fils. good. Best offer. SASE for list to Don Merz, 47 Hazel Drive, Pittsburgh, PA 15228, (412) 344-0956 (7 PM - 10 PM EDT).

WANTED - BC/SW TUBE RADIOS

Philco 51 chassis, AK 708 chassis, AK 246 cabinet, Western Electric amps, rcvrs, speakers, mics, tubes, antennas, parts and literature. Marc Ingenthron, 9748 Outlook, Overland Park, KS 66207, (913) 642-4767.

Want restorable Zenith wood table radios 6S27, 6S128, 6S137, 8S129 and 10S130. Also other brands of tombstones and cathedrals, any cond. Basket cases OK. James Fisher, 344 Harrison Ave., Manville, NJ 08835.

Zenith radio or junker chassis 6S330 or 6S331 chassis 5G48; require primarily push-button and speaker assemblies. R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083, (609) 783-4175.

Black or red coloured Electrohome "Music Box." Top dollar-plus paid. Gordon Wilson, 11108 50 Ave., Edmonton, Alberta, T6H 0H9, Canada, (403) 434-6257.

Zenith 7S363 console, Zenith 9S365 or 6S362 pushbutton assemblies; Airline 62-101 chassis; 21FJP22A or 21GVP22 CRT; dial for Kolster K20. Keith Park, 795 Grooms Rd., Rexford, NY 12148, (518) 373-0417.

Zenith table radio 12S445. Robert Schoenbeck, 9301 Texhoma Ave., Northridge, CA 91325, (818) 993-7174.

Extra-nice Thermiodyne TF-6 or TF-7 w/front door. Radiola II, Atwater Kent 21, mint complete Crosley "Pup." Have for trade an extra-nice Kennedy 281 for extra-nice AK breadboard with tags. Brian Rhodes, 72 Mt. Hermon Rd., Blairstown, NJ 07825, (908) 459-4583.

WANTED - COMM GEAR

Collins: 32V-3, 75A-3, 270G-3 speaker; 500-Hz mech. filter for 75A-3; 51J-4 meter; 75A-4 vernier drive. Paragon RA-10, DA-2 amp. Cash, trade up or down. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237, (412) 931-4646.

HRO-5A1 coils F, H, J; HRO-50 coils F, G, H, J; old HRO receivers; also E. H. Scott radios. Carter Elliott, 1460 Pinedale Rd., Charlottesville, VA 22901, (804) 979-7383.

Harvey-Wells TBS-50C carbon mike. Any orig. TBS-50 or Harvey-Wells manuals, transmitters, receivers or ads. Gary Fender, PO Box 639, Escatawpa, MS 39552.

Central Electronics 600L linear amp., any cond.. Neil Spencer, W4PC, 4665 75th Ave., North Pinellas Park, FL 34665.

WANTED - GENERAL

Panel for Aeriola Amplifier; base and driver for Thorola horn; "Radio Blue" headphones; British crystal sets. Roger Hart, 4533 Harvard Ave., Montreal, Quebec H4A 2X3, Canada, (514) 483-3857.

Rider's radio Vols. 18, 20, 22, 23. Have cash or earlier vols. to trade. Chassis for GE K63, Crosley 124, 125, AK 228, Majestic 195, 363, Westinghouse WR 14, junkers considered. Brian Kurrle, 208 Crafton Rd., Bel Air, MD 21014 (410) 838-6534.

Info on RF power-output control circuit on a Tempo VHF One Plus; Ameco 621 VFO; Western Electric rcvrs & amps; literature, tubes & components; Mershon electrolytic capacitor, glass jar or copper container in any cond.; Rock-Ola jukebox remote-control unit. Tad Drogoski, N3JZQ, 507 Coal Valley Rd., Jefferson Boro, PA 15025-3703.

BC/SW tube radios; Klitzen 125 detector-amp (Douglas Vol. II, p. 170); Mesco spark xmtg tuning coil; Murdock high-tension condensers. Phillip Drexler, 1175 E. Ripley Ave., St. Paul, MN 55109, (612) 771-8630.

Radio advertising signs, clocks and other items. Have cash or trade items. Rick Yerke, PO Box 392, Moscow, PA 18444, (717) 842-4857.

WANTED - INFORMATION

Info on Collins Radio Co. incl. promotional items, catalogs, manuals and technical pubs by Collins after its beginning in 1933. Jim Stitzinger, 23800 Via Irama, Valencia, CA 91355, (805) 259-2011.

Would like to hear from others who worked at J. P. Seeburg or Merit Transformer in Chicago in the early 1950s. Ray Larson, 12241-½ Gorham Ave., W. Los Angeles, CA 90049-5214.

Years ago when VTVMs required a 1-1/2 battery for the ohms measurements, a substitute unit called an "Electrotec" had 3 wires, 2 across the 6-V filament and 1 lead to the 1-½ terminal. Does anyone have a circuit diagram of the substitute? Alton DuBois, Jr., 67 Peggy Ann Road, Queensbury, NY 12804.

Schematic for Rogers Majestic Serial No. 22. A 7-tube battery type. Like made in Canada. H. D. Thompson, 9020 106 Ave., Fort St. John, BC V1J 2N2, Canada.

Info on 1935 Lincoln Symphonic. 20 tubes, two speakers. Does anyone have one or once owned one? Any help apprieciated. Don Hauff, PO Box 16351, Saint Louis Park, MN 55416.

Info on freq coverage of AN/ALQ-91 (military); copy of schematic of power supply for LORAN rcvr, model number missing, 110-V, 60-Hz, tube type with 3" CRT with magnifying glass, black case; copy of service manual for Marconi Marine tube rcvr, model Atalanta, 110 V ACDC, freq coverage 15 kHz - 28 MHz. Alfonso E. Patron, XE2R,

Campana 1914, Mazatlan, Sin 82000, Mexico.

National FB-7 winding info for 160-, 80- and 40-meter bandspread coils, also coil sets or coil parts. Jim Hanlon, W8KGI, PO Box 581, Sandia Park, NM 87047, (505) 281-0814.

Manual and/or more recent data for a Hickok KS-15750-L1 Code No. 3200-54 tube tester built for Western Electric, with chart dated 10-1-55. David J. Lowenstein, N7AF, 236 La Jolla Dr., Tempe, AZ 85282.

WANTED - LITERATURE

Will swap Vol. 7 (1992) AWA Review for Vol. 4 (1989) AWA Review. Marvin Moss, PO Box 28601, Atlanta, GA 30358.

Any 1940-48 Allied, Walter Ashe, Lafayette, B. A., WRL catalogs. Have cash or trade items (catalogs, "Radio" Handbooks, ARRL Handbooks, early *PE*, *CQ*, *QST*, *Radio-Craft*, *SW Craft*, *Radio News*, *73*, *Radio*, etc. Al Bernard, PO Box 690098, Orlando, FL 32819, (407) 351-5536.

Copy of manual, schematic or anything else to help me calibrate a Realistic 131 e_m and g_m tube tester. This is the one Radio Shack used in all their stores some years ago for testing customer tubes. Probably made *for* them but don't know by what manufacturer. Ged Bryon, 194 North Valley Rd., Pelham, MA 01002, (413) 253-3984.

Amareur, gov't and comml. callbooks, 1900-30; 1900-08 deForest/Marconi and other pamphlets listing user callsigns. Bob Arrowsmith, W4JNN, PO Box 166, Annandale, VA 22002, (703) 560-7161.

Collector wants to buy of QSL card, call books, ephemera, books, magazines and catalogs. Joseph Holstein, N8EA, 1515 Sashabaw Rd., Ortonville, MI 48462.

Copy of Fessenden - Builder of Tomorrows by Helen M. Fessenden; biographies of euarly radio people. Also info on Harry Shoemaker of United Wireless. Mike Heffner, 724 Elmira St., Williamsport, PA 17701, (717) 323-3647.

Need manual or schematic for B&K 445, Eico 379, Eico 330, Semcor RC-115, TS-888. Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30358.

Book or schematic for RCA Senior Voltohmyst WV-98A, WV-97A, and Heathkit VTVM V-7A. Richard LaMark, 6822 Tuckahoe Rd., Williamson, NY 14589.

QSTs before 1923 to complete my collection. edward J. White, WA3BZT, 809 Seymour Road, Bear, DE 19701-1121.

Rider Radio Manuals, Vols. 1, 3 and 5. Ghirardi Radio Troubleshooter's Handbook. Ed Martin, 485 Benwood Hill Rd., Benwood, WV 26031-130

Radio Boys books by Allen Chapman with orig. dust jackets only. Henry O'Meara, PO Box 384, Honeoye, NY 14471.

Paying up to $50 (depending on cond.) for book Construction of Induction Coils & Transformers by Curtis. Harry Goldman, 3 Amy Lane, Queensbury, NY 12804.

Operator's manual for Philco 7050 tube tester, photocopy OK. Harold Kelly, 323 Merriam Ave. N., Thief River Falls, MN 56701, (218) 681-4462.

First Radio Book for Boys by A. P. Morgan; 1930s-40s Allied Radio catalogs. John Hurst, KU6X, 2512 Euclid Crescent East, Upland, CA 91786, (909) 981-6759.

For Stoddart NM-40A receiver: power supply, manual or schematic (copy OK) and antennas. Marty Sagendorf, K1CVF, Box 21, Hat Shop Hill, Bridgewater, CT 06752.

WANTED - MILITARY

British RAF bomber T1154 xmtr & R1155 rcvr in exc. unmod. cond. Mike Ceklovsky, 3116 Smokey Court, Sacramento, CA 95826, (916) 363-3211.

Have nice BC-375E WW II xmtr. Like to trade for complete W.S. 19 Mk II w/accessories. Steve Bartkowski, 4923 W 28 St., Cicero, IL 60650.

Clean BC-454 (3-6 MHz) w/o dynamotor, with or w/o tubes. Kenneth P. Olson, RR #1 Box 145C, Hillman, MN 56338.

WANTED - PARTS

Transformers by UTC: LS-10, 10X, -12, -12X, -15, -15X, -18; A-10, -24; HA-100X, -101X; high-pass filters HMI-50 and -100; Hy-Vac 15B mini tubes; Hycor 4201 passive EQ; UTC 3A, 3AX, CGE-1 equalizers; Gates, Collins, RCA broadcast limiter. R. Robinson, 868 S. Main St., Plantsville, CT 06479, 24-hour msgs (203) 621-7445; fax (203) 294-1745.

Tube shields (3), dial and knobs for Philco 37-620. Dynaco stereo preamp or two monos; dial for Philco 40-155. Carlos Martinez, 21 Colonel Irizarry St., Cayey, PR 00736, (809) 263-2741.

WANTED - TELEGRAPH & KEYS

T. R. McElroy keys, pre-WW II literature, other McElroy items. Look for "the hat" at Rochester. Tom French, W1IMQ, "The McElroy Collector," 120 Grant Road, Maynard, MA 01754

Keys, bugs, paddles. Will trade other keys or buy. Particularly looking for old or unusual keyer paddles. John Rehak, N6HI, "The Keyer Paddle Collector," 4035 E. Lavender Lane, Phoenix, AZ 85044, (602) 759-8019.

Early telegraph gear such as camelback keys, weight-driven registers, miniature lineman's test sets, needle-telegraph sets, odd-ball telegraph gear such as the Beardslee, etc. Also looking for unusual speed keys (bugs) such as Boulter. Gil Schlehman, K9WDY, 335 Indianapolis Ave., Downer's Grove, IL 60515, (708) 968-2320.

WANTED - TEST SETS

GR 1454 AN decade divider; Heath IP-17 pwr supp; Thordarson T-30WO8A amp. Have Tektronix manuals and MIT Rad Lab volumes for trade or sale. Lawrence Larsen, 308 Hamilton Ave., Silver Spring, MD 20901, (301) 587-8143.

WANTED - TRANSISTOR/CRYSTAL SETS

European and Australian shirt- and coat-pocket sized xstr radios. Also Privat-ear. Send photo or photocopy of front of radio w/asking price; include phone and/or fax number. Trades available. David Mednick, 1450 Palisade Ave., #5-H, Fort Lee, NJ 07024, (201) 461-3082; fax (attn. Dr. Mednick), (201) 928-0811.

Transistor radios made in US or Japan. Need not be perfect or wkg.. Also toy crystal (germanium-diode) radios. Eric Wrobbel, 20802 Exhibit Court, Woodland Hills, CA 91367, (818) 884-2282.

Factory-made crystal sets, crystal-radio kits, toy crystal sets and pocket crystal radios. Please make offer with your price and if possible include photo. Many thanks! Erwin Macho, Ambrosweg 17/A/8, A-1230 Vienna, Austria.

WANTED - TUBES & TRANSISTORS

De Forest DV-3A w/intact filament, with can, if present. Top dollar paid. Charles Swigart, 3717 Burton Ave., Toledo, OH 43612, (419)-478-6818.

Transistors, Raytheon CK-721 and CK-722, electrical cond. not important, good physical cond. please. Gene Grenedker, 184 Lake Somerset Dr., Marietta, GA 30064.

SALES ANNOUNCEMENTS

AWA REVIEW

Volumes 2, 6, and 7 of the AWA Review are obtainable, and Vol. 8 is in preparation for availability in October. Contents of 2, 6, and 7 are listed in the November *OTB*, pp. 6-7; material in Vol. 7 is also listed in the February issue, p. 46. Price for any volume, postpaid, is $12.50 (U. S. and Canada; $14 elsewhere). To order, send a check payable to "Antique Wireless Association" to AWA, 44 E. Main St., Flemington, NJ 08822-1224.

As another option, many members combine a Review order with a membership renewal on one check, sending it to the Breesport office.

Various issues of the Review are available from the vendors below, offering credit-card convenience while stocking up on books, tubes, or restoration parts. The addresses: Antique Electronic Supply, 6221 W. Main St., Tempe, AZ 85282, (602) 820-5411, fax (602) 820-4643; and *Antique Radio Classified*, PO Box 2, Carlisle, MA 01741, (508) 371-0512, fax (508) 371-7129.

EMPIRE OF THE AIR

The Association has a few copies of Tom Lewis' Empire of the Air, hardbound, available at a discount price: $20 plus $1 shipping. Orders may be directed to Dexter Deeley at 8 Briar Circle, Rochester, NY 14618 - or combined with an *OTB*/Review order to the Flemington location.

"FEDERAL" BOOK

Booklet of 64 pages describes Federal Tel. & Tel.'s radio operation from the beginning in 1921 to its demise in 1929 (see review in this issue). Over 60 illustrations, including pictures of early Federal RF and audio amplifiers, all early radios, and many Federal parts. The article and presentation by Dick Schamberger, Federal expert, are included. All Federal models are listed with the year and month introduced, price new, and brief description. Buffalo's first broadcast station, Federal's WGR, is described. There are two pages of references for more Federal info. This is more about Federal than exists in any other spot! Good-quality printing. Send $4.95 + $1.00 S & H to Larry Babcock, 8095 Centre Lane, East Amherst, NY 14051.

PUERTO RICO: HISTORY OF RADIO

By Lewis Manuel Medina

In 1922, WKAQ was established in San Juan, PR as the world's fifth radio station.

The History of Radio (published in Spanish and titled Historia de la Radio) is a new book about the history of the 117 civilian stations - and eight military ones - on this Caribbean island. Puerto Rico is an American territory with limited international representation since 1898. Radio and TV are regulated by the FCC.

For more details on the book, please send two 29¢ stamps to History of Radio, Apdo. 145, Lares, PR 00669-0145. (US-PR mail is domestic, of course.) (L. M. Medina)

PROFESSIONAL DISPLAY CASES

For flat-on-the table displays of small, high-value articles (at home or in an Equipment Contest), and for flea-market use, a broad line of locking,

glass-topped portable cases is available. Besides the basic flat style, two- and three-tier models are offered. Pads for the bottoms of cases are available in a variety of styles and colors. For a color catalog, the address is Allstate Manufacturing Co., 224 Market St., Perth Amboy, NJ 08861, 800-262-2340 or (908) 442-1199. (Source material: Bro. Pat Dowd)

OTHER OFFERINGS

Scott grille cloth: Amid the variety of grille cloths now available for restoring receivers is a style woven to duplicate that found on Scott sets. This latest version is a golden brown, coarse weave, with some red and black threads for toning. A 4" x 4" sample is available for $1 (refundable with order) and a LSASE, from John Okolowicz, 624 Cedar Hill Rd., Ambler, PA 19002.

BC/SW tube radios: Philco 1937 model 37-690, 300-lb console, 20 tubes, 7 speakers, two chasses, 15+ watts audio power, p-p 6B4s, "magnetic" tuning, 5 bands. Pick up only. Taking bids. Francis Yonker, W2IBH, 1229 Inverary Place, State College, PA 16801, (814) 867-1400.

Schematics: 1920-70 radio, ham, TV, electronic organs, test gear, Canadian, misc., $5 PPD. For quotes on manuals, send SASE. "If I don't have it, you probably don't need it." Also have Tektronix RM-503 scope manual and other Tektronix manuals. Alton Bowman, 4172 East Ave., Canandaigua, NY 14424-9564.

NOS and used radio-repair parts, tubes, test equipment, service data. Write wants. SASE for reply. Frank Krantz, 100 Osage Ave., Somerdale, NJ 08083.

Morse Operators: Repros of Bunnell "Acme" resonators. Black pedestal, hoods (drilled for main-line or local sounder), your choice of dark red, gray, WU green or natural. Felt base, 4-ft cord., $45 includes UPS. No CODs. Jack Proefrock, K6QEQ, 20814 S. Hawaiian Ave., Lakewood, CA 90715/TDC.

"Unreleased Edison Laterals" is a compilation of 21 songs recorded by the Edison Company but never released. Includes jazz and hot dance numbers from the late 1920s, and "Radio Girl" Vaughn de Leath. A by-product of a six-year collaboration between National Park Service and me aimed at restoring their archival collection of test pressings. The compact-disc version costs $17.98, the cassette version $11.98 postpaid (add $2 for Europe). Craig Maier, 164 Meriden Rd., RD #2, Boonton, NJ 07005.

Knobs: Custom molded plastic. Send knob to be duplicated plus $8 ea. for plastic, $12 ea. for imitation wood or Catalin. Custom-formed plastic dial lenses. Send old lens, if possible, tracing of lens opening, bezel if radio has one, plus $15 each. L. Wade Terrell, 7109 E. Arbor Ave., Mesa, AZ 85208.

Stock certificates: Admiral, Sentinel, AT&T, Western Union, IRC, Tung-Sol, Philips NV, Jefferson-Travis, $10 ea. ppd; Collins Radio Co., $20. ppd. J. J. Papovich, 53 Magnolia Ave., Pitman, NJ 08071, (609) 582-8279.

Old-time radio shows on tape cassettes: Catalog listing early 5000 shows arranged by category and title, $2. Herbert Parsons, Jr., PO Box 2284, Peabody, MA 01960.

Windup phonograph repair service: antique phonograph repairs, parts, mainsprings, needles via UPS. Free catalog. Send long SASE to Rod Lauman, 8 Sunset Circle, St. Johnsbury, VT 05819, (802)748-4893 eves.

First user-friendly circuit on early BC-348s; most component values on two sheets 8 x 14, reads left to right, $2 plus (2) 29¢ stamps. Ray Larson, 12241-½ Gorham Ave., W. Los Angeles, CA 90049.

1928 - BIRTH OF THE PHILCO RADIO

That's the title of MAARC Monograph No. 3, authored by club librarian and Philco enthusiast Michael Prosise, and issued this year. This is a well written and handsomely laid out 22-pager in 8-½ x 11 format, covering the formative years (or *year*!) of Philco. It devotes attention to Philco's origins as a storage-battery maker, later a producer of "socket power" units, and its near-instant transition to making plug-in radios when the arrival of AC tubes killed the battery-eliminator market. Prosise covers the electronic design of important early sets (especially the Model 511), and gives considerable coverage to the hand-painted metal sets of the 1928 line. This is Good Stuff for anyone interested in the earlier Philcos.

Back issues of the regular MAARC monthly Newsletter are $1.50 each, but copies of this special monograph are $5 (postpaid) due to the higher costs involved. Checks may be sent, payable to Mid-Atlantic Antique Radio Club, to Michael Prosise, 3658 Daisy Rd., Daisy, MD 21797. (MAARC membership is $15/yr for North American members.) - LAS

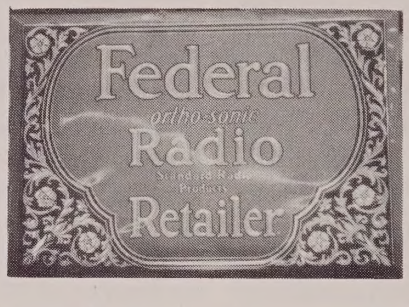
CANADIAN REUNION ALERT

A reunion of the Walter H. Lambert Communications students of Room 19, King Edward High School, is being organized for Sept. 30 in Richmond, BC. For information contact Hugh Martin, R. R. 4, Site 455, Courtenay, BC V9N 7J3, (604) 334-3015; or Len Avent, R. R. 1, Site 165, Comox, BC V9N 5N1, (604) 339-3833. [Al Miller, VE7KC]

MUSEUM NEWS: NFWA's FEDERAL EXHIBIT

Larry Babcock
8095 Centre Lane, E. Amherst, NY 14051

An impressive display of Federal radios and related material is currently in the Amherst museum near Buffalo, NY, site of the Federal factory of the 1920s.

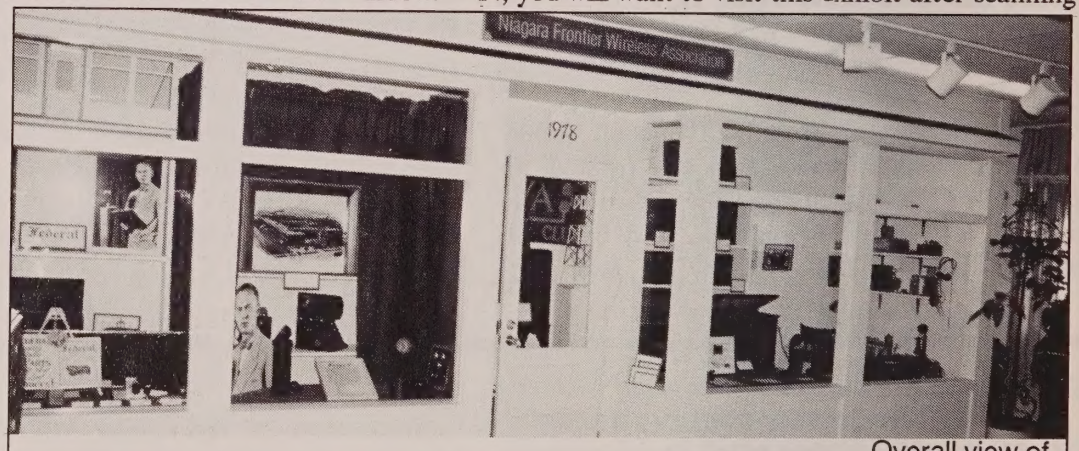


The Niagara Frontier Wireless Association maintains a permanent display of antique radios at the museum. NFWA's exhibit is rotated annually so that repeat visitors see fresh material. All the artifacts are loaned by NFWA members. Curator for this exhibit is Art Albion.

The club's material is displayed behind a series of four windows and a doorway built to resemble an old-time radio storefront. Each area shows a different aspect of Federal.

The leftmost window displays parts made by Federal, which produced more early components for the home constructor than for factory-built sets. Tube sockets, rheostats, switches, audio and RF coils, and tuning condensers are on display, along with radios home-built with them.

Federal operated Buffalo's first radio station, still on the air as WGR. Artifacts from this first station are exhibited behind the second window. This includes one of the station's first microphones, a lighted "On the Air" sign, and full-size photos of the station manager and an announcer from WGR as of 1926. A large color photo shows the Federal factory with the wire-cage "L" broadcast antenna on its roof.



Overall view of old-time storefront display. Each 5' x 9' section was built and painted in the basement of NFWA president Floyd Engels. The "1978" street address marks the year of NFWA's founding.

A Federal console is on view through the store-door window. It stands on an original wood shipping crate. Atop this set is the finest showroom sign I have ever seen! It has FEDERAL in raised gold lettering and scrollwork on a dark-blue background, and is in perfect condition. Models of early transmitting towers flank the console, with the NFWA club banner displayed behind it.

The next window shows Federal's earliest radios. The company's first complete receiver was the Junior crystal set; the first full tube radio was the Model 57. Both are displayed, along with a DX-58, 59, 61, 110, and A-10 Ortho-Sonic. There are several Federal headsets and a "Pleiophone" horn speaker. Original ads and the new 64-page Federal booklet (see review in this *OTB*) are included; the book is on sale in the museum's gift shop.

The last window shows a 1920s radio service bench with items used to repair sets at the time: test equipment, tubes and parts, service data, a vintage calendar, a manual "candlestick" telephone, and even solder splashes on the bench.

Adjacent to the exhibit is a reference area with a set of Rider's manuals for use by anyone seeking service data for an old radio, with the museum copier available. The museum has its own display of radio artifacts in the rest of the room. NFWA is working with the museum to turn this display into a chronology of communications, with a display booth for each decade starting with the 1920s.

If you come to the NFWA-AWA meet on August 14, you will want to visit this exhibit after scanning the flea market. The Amherst museum emphasizes technology; you will find numerous informative displays, including the history of aircraft built in the Buffalo area.

The museum (formally the Amherst Colony Museum Park) is out in the country and easy to reach. From Thruway Exit 49, go north on Rte. 78 (Transit Rd.) about nine miles to the border of Niagara County. Then go west on Tonawanda Creek Rd. about two miles. Operating hours: Tu-S, 9:30 to 4:30, closed holidays. Phone: (716) 689-1440.

BOOK AND MAGAZINE REVIEWS

EDITED BY
Bruce Kelley
59 Main St., Bloomfield, NY 14469

HISTORIC TELEVISIONS & VIDEO RECORDERS

By Michael Bennett-Levy

Large paperback format, ISBN 0 952 1057777 0 5, £12.95 in the U. K, £15 overseas, from MBL Publications, Monkton House, Old Craighall, Musselburgh, Midlothian EH21 8SF, England.

This is the first book printed on television cabinet design. The author illustrates 120 sets in full-color photographs, starting with prewar British receivers and ending with early video recorders. The book will appeal to TV collectors, since it covers sets of unusual design, such as the prewar Baird T-14, which includes a mirror-in-lid TV, auto-phonograph, radio, and built-in bar with bottles and glasses! Outstanding photography. - BK

FEDERAL TELEPHONE & TELEGRAPH CO.

By Larry Babcock

Soft format, 5-½ x 8-½", 64 pp., 61 illus., $4.95 plus $1 shipping, from the author at 8095 Centre Ln., E. Amherst, NY 14051.

This volume was produced in cooperation with the Niagara Frontier Wireless Association, world center of Federal-ism. It provides a good variety of information on Federal during its radio-building days (1921-29). It furnishes descriptions of the Federal receivers, ranging from the No. 55 RF amplifier (on the vanishing side of rare) through the Ortho-Sonic sets of 1928-29. It publishes the text of a talk given by NFWA-AWA member Dick Schamberger, and a journal article by the same author. There is coverage of radio parts offered to the home constructor by the company, brief material on Federal's station WGR, and a handy table of receiver models.

Some interesting bits of knowledge emerge. The odd-looking case of the Federal Junior crystal set and its rare two-stage amplifier (*OTB*, Vol. 14 No. 2) are pointed out as having been adapted from one of Federal's handset-type telephone sets. There is coverage of two unusual factory-prototype receivers, supplementing the coverage of the mysterious Federal "Red Jacket" receiver in *OTB*, Vol. 30 No. 1. There is a bibliography of literature, old-time and recent, on Federal.

To sum up: this is a handy and useful reference, reasonably priced, that adds details on Federal in addition to those in Vol. 1 of Alan Douglas' Radio Manufacturers of the '20s. - LAS

FESSENDEN AND EARLY RADIO SCIENCE

By Dr. John Belrose, VE2CV

For more information on the paper and Fessenden, write the author at Communication Research Center, Box 11490, Stn. H, Ottawa, Ontario K2H 8S2, Canada.

The author recently delivered a paper covering Reginald Fessenden's contributions to radio at a meeting sponsored by the Communication Research Laboratory at McMaster University. The report, in loose-leaf form, is an up-to-date record of one of radio's foremost pioneers. As part of his talk, John reenacted what may have been the world's first voice transmission by radio: Fessenden shouting (!) into a carbon microphone coupled to a spark transmitter. The date: Dec. 23, 1900.

I have always had strong doubts about modulating a spark transmitter but the author, after much adjusting, replicated Fessenden's early experiments. My doubts vanished upon playing a tape cassette recorded at the meeting. First, I heard the noisy spark transmitter and then, distinctly in the background, Belrose's voice! - BK

A FIRST CLASS JOB - FRANK MURPHY - RADIO PIONEER

By Joan Long

209 pp., 6" x 8" paperback format, reprint of a 1985 release. £7 plus £1.50 shipping & handling ($15 in U. S. and Canada), from the author at 5c Weybourne Rd., Sheringham, Norfolk, NR26 8HF, England.

We reported availability of this item in the February *OTB*. With the book in hand, it's possible to give more detail. This is a biography of Frank Murphy, British maker of radios (1929-36) and uniquely designed furniture (1938-46), written by his daughter. Murphy, an electrical engineer, was driven by the desire to make consumer products that gave the user good value, and to distribute them via a new concept of business involving unusual emphasis on fair dealing with his dealer network and the public. After Murphy Radio had achieved success producing radios of continually decreasing cost during the Depression, the founder suddenly left the firm, his motive ascribed to conflict between his values and those of the other managers. The furniture venture, involving designs incorporating ergonomic research as well as aesthetic considerations, failed due to the onset of

WW II and the business difficulties of postwar recovery. Murphy emigrated to Canada and started a short-lived venture that made high-quality console phonographs.

This is novel reading, of greater impact to British radio enthusiasts than Americans, but the Murphy brand name is known even here because the original company lasted well into the TV era. - LAS

ALEXANDERSON, PIONEER IN AMERICAN ELECTRICAL ENGINEERING

By James E. Brittain

Johns Hopkins Studies in the History of Technology, Johns Hopkins University Press, Baltimore, MD, 1992. 384 pp, illus., $45.

Much has been told about E. F. W. Alexanderson, including papers, slide shows, and movies at AWA conferences. Now, for the first time, a book has been written on his life and accomplishments. No better technical writer could have covered Alexanderson than Dr. Brittain. He accurately documents the inventor's personal life as well as his career at GE. The book is a *must* for radio historians. Highly recommended. - BK

1993 CATALOG - FAIR RADIO SALES

Fair Radio is the last old-time dealer in "surplus" electronics, having started in 1947. This catalog presents as good a variety of comm gear as they have ever offered. For the WW II radio collector, they have BC-1000 and MAB transceivers, and have somehow brought back AN/ARC-1 VHF transceivers, BC-348 HF receivers, and AN/ART-13 HF transmitters. The ARC-5/SCR-274N material is gone (they still have the receiver dynamotors!), but there is all manner of Cold War gear: PRC-47s, AN/GRC-9s, T-368/URTs, GRC-109s, R-390A/URRs and so on. Some rather recent solid-state material includes the R-1518/URR-71 VHF receiver and AN/GRC-165 (Harris 301/302) SSB transceiver.

The 36-page catalog offers parts, tubes, radio-collector books, plus original and repro tech manuals covering 130 sets.

Fair Radio is at 1016 E. Eureka St., PO Box 1105, Lima, OH 45802, (419) 223-2196, fax (419) 227-1313. I've placed 10 or so orders with them over several years and gotten good service. - LAS

HISTORY OF INTERNATIONAL BROADCASTING

By James Wood

Hardbound, 258 pp, illus., $59, available in the U. S. from Dotty Rodriguez, PPL Dept., IEEE Service Center, 445 Hoes Lane, Box 1331, Piscataway, NJ 08855-1331, (800) 678-IEEE or (908) 981-0060; fax (908) 981-9667.

The author describes VOA, BBC, and other super-power broadcasters in both program content and technical detail. Transmitters of 500-kW size are common, with many stations rated at 2 MW and more! For one interested in high-power broadcasting, this is a book to read cover-to-cover. It gives up-to-date technical data on expansions planned or under way in many countries, particularly the U. S. and Arab states. Some of the latter have broadcast capacity that dwarfs that of Western countries [try, for example, an Effective Radiated Power of *15 megawatts* in the BC band! - Ed]. Highly recommended. - BK

RECENT RADIO AND ENTERTAINER OBITUARIES

Charles Griffen, W1GYR
1225 New Britain Ave., West Hartford, CT 06110

Fritz Gross, 82, developer of early radar systems, notably the Navy's SG system of WW II.

Oscar C. Hirsch, 96, pioneer broadcaster who built radio-TV stations in southern Illinois and southeastern Missouri. He started KFVS, Cape Girardeau, in 1952; also WHCO, KSIM, and KFVS-TV.

William Lodge, 85, early executive with CBS radio & television. Joining CBS as an engineering assistant in 1931, he advanced to Director of Radio Engineering in 1937, VP of Engineering in 1949, VP of Engineering at CBS-TV in 1952, and VP of Affiliate Relations and Engineering in 1957. He managed the introduction of broadcast-grade videotaping, allowing delayed broadcasts to the West Coast; the conversion from monochrome to color; and the early use of microwave relays.

Samuel T. Mazza, 77, retired 17-year chief engineer at KSO, Des Moines. He joined the Voice of America in 1952.

Dagmar Reem, 92, radio pioneer. In the 1930s she established KFPV, Coeur d' Alene, Idaho, with her husband Clifford.

C. Trafton Robertson, 84, early radio announcer; morning host at WTAR, Norfolk, VA. On the Mutual network, he served as the presidential announcer in Washington, introducing Franklin D. Roosevelt's "fireside chats" during the 1930s-40s.

William N. Udell, 71, broadcaster in Indiana; 1949-89 owner of WIMS, Michigan City, and continuing as owner of Northern Indiana Broadcasters with its WKAM, Goshen, and WZOW, Elkhart.

SILENT KEYS

(AWA members, with or w/o amateur licenses)

Edgar Burge
Alva Collins
Carleton Maylott, W2YE, 90, RCA engineer during construction of the Riverhead and Rocky Point stations.
James R. McCann
Roger Snelling
Lee Stanley, W2ECM
Tom Socci, W2RUK

THE MUSEUM

AWA ELECTRONIC COMMUNICATION MUSEUM

Location: Village Green, NY 5 & US 20, Bloomfield, New York
Hours: May 1 through October 31: Sunday, 2-5 PM; also, June 1 - August 31: Saturday, 2-4 PM and Wednesday, 7-9 PM. (Closed Holidays)
Group tours: by appointment
Museum telephone: 716-657-6260
Amateur Station: W2AN
Mailing Address: Bruce Kelley, Curator, 59 Main St., Bloomfield, NY 14469
FREE ADMISSION

AWA RECEIVES UNUSUAL SPARK TRANSMITTER

In the photo, Joe Meyer, W2VW (left) is holding a high-voltage capacitor made with glass plates in the traditional format of 8" x 10" old-time photo negatives, while curator Bruce Kelley, W2ICE, admires a Clapp-Eastham "Boston" key - all part of a unique spark transmitter that Meyer recently donated to the Museum. In the background is a hefty oscillation transformer made from brass ribbon and wound in "pancake" format. On the car bumper is a knife-type send-receive switch. Not seen is a Marconi-type "ring of fire" rotary gap consisting of eight stationary electrodes, demonstrated at the 1983 Conference with suitable sound and flashes and pictured in action on the cover of the June 1984 *OTB*. Joe, aged 93, went on the air in 1916 but fears there is little future in spark transmission!

NEW GEAR IN MUSEUM

John Belrose, VE2CV; Hartley Bowen, KD2AF; Ted Capron; Sanford Danziger; Bro. Patrick Dowd, W2GK; Paul Egan; Tom Galbreath, W2AXX (SK); Bob Gleason, W3KW; Wm. Higinbotham; Herbert Hopper; Joe Meyer, W2VW; Ed Preston, W2RIZ; Charlie Reynolds, W2KY (SK).

DONATIONS NEEDED FOR AUCTION

This year, we are asking members to donate salable items for the auction at Rochester, with all proceeds to support maintenance of the AWA Museum. This is common practice among antique-radio clubs, and is a handy way for members to turn an unwanted collectible or two into valuable (and tax-deductible) aid to the Museum's operation. Please contribute something!

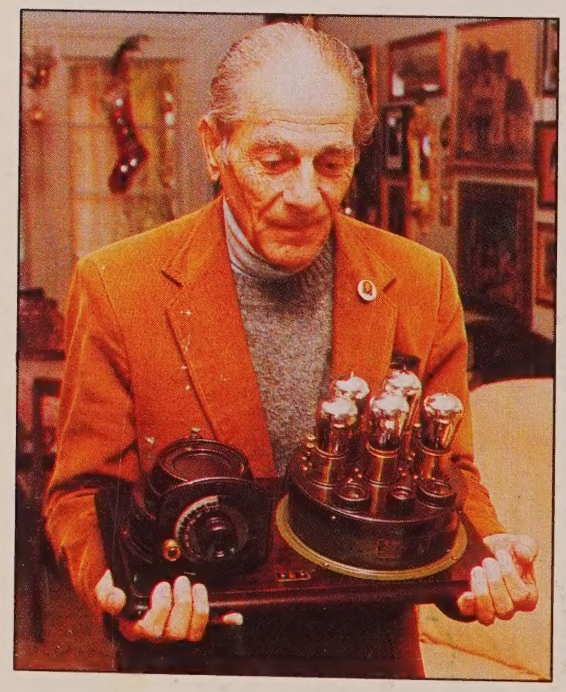
Material sought is radios, comm gear, tubes, literature - items of the sort generally appearing in the various Rochester auctions. Donations may be brought to the regular auction check-in on Thursday evening. However, donors in the local area can get even better impact by bringing the item(s) to the Museum or Museum Annex during the summer. This way, we can list them in a catalog that is planned for distribution in advance at the Conference. For details, please contact the Curator.

A number of interesting items are pledged already, so this special sale should be of great interest.

JUST PIX

European receivers of Twenties vintage located by Swiss collector Helmut Krüger (see story inside). Left: French regenerative set (detector and two audio stages); center, the famous Loewe OE 333 ("Orts-Empfänger," or ~ "local receiver") with the 3NF triple-triode; right, a German "Isaria AK" one-tube regenerative set.

An example of neat organization of a collection with efficient use of space. This is part of Bob Dennison's (W2HBE) antique material: interesting old-time tubes and their cartons, lightning arrestors, antenna insulators, and - flat on the door - eye-catching '20s-'30s literature. Since the photo was taken, a large Western Electric water-cooled transmitting tube has been added in the area above the door.



Paul Giganti, W6GVY, proudly displaying his Atwater Kent Model 5 breadboard receiver. The "5" is, of course, one of the most collectible early broadcast sets.